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HIGH ALTITUDE PERFORMANCE TEST OF THE YJ97-GE-3 TURBOJET ENGINE (S/N E447007) (PART I) (U)

W. R. Warwick, B. W. Hartsfield, and B. W. Overall

ARO, Inc.

October 1968

ROCKET TEST FACILITY
ARNOLD ENGINEERING DEVELOPMENT CENTER
AIR FORCE SYSTEMS COMMAND
ARNOLD AIR FORCE STATION, TENNESSEE

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FOREWORD

(U) The work reported herein was performed at the request of the Air Force Aero-Propulsion Laboratory (AFAPL) (APTP), Air Force Systems Command (AFSC), for the General Electric Company under Contract Number AF30(657)-16142, System 468A.

(U) The results of this test were obtained by ARO, Inc. (a subsidiary of Sverdrup & Parcel and Associates, Inc.), contract operator of the Arnold Engineering Development Center (AEDC), AFSC, Arnold Air Force Station, Tennessee, under Contract F40600-69-C-0001. The tests were conducted in Propulsion Engine Test Cell (T-4) of the Rocket Test Facility (RTF) from January 25 to March 14, 1968, under ARO Project No. RD0820, and the manuscript was submitted for publication on July 2, 1968.

(U) This report contains classified information extracted from the Model Specification No. E-2054 for YJ97-1 and YJ97-3 engines, dated August 1, 1966, and its revision dated February 1967 and January 1968, Confidential, Group 1.

(U) This technical report has been reviewed and is approved.

Donald W. Ellison
Lt Colonel, USAF
AF Representative, RTF
Directorate of Test

Roy R. Croy, Jr.
Colonel, USAF
Director of Test

CONFIDENTIAL ABSTRACT

(C) An altitude performance calibration of the J97-GE-3 turbojet engine (S/N E447007) was conducted as part of an official Qualification Test. The engine was tested over a range of Mach numbers from 0.80 to 0.85 and altitudes from 40,000 to N + 5000 ft. The engine specific fuel consumption, at the guarantee thrust levels, was from 2 to 4 percent lower than the specification guarantees at all of the guarantee flight conditions at which data were obtained. A comparison between scale force and momentum balance methods of determining engine thrust indicated agreement within 2 percent. The test was terminated by a second-stage turbine disk failure.

CONTENTS

APPENDIXES

NOMENCLATURE*

A	Area, in.^{2} or ft^2
AE8	Primary exhaust nozzle effective throat area, in.^{2}
ALT	Altitude, ft
CF	Discharge coefficient
CFG	Convergent-divergent equivalent thrust coefficient
CV	Velocity coefficient
c_p	Specific heat at constant pressure, Btu/lb_m-°R
c_v	Specific heat at constant volume, Btu/lb_m-°R
DTO	Off-standard temperature, ±°F
ETABM	Main burner efficiency, percent
ETAC	Compressor efficiency, percent
F	Fuel-air ratio, lb_m-fuel/lb_m-air
FD	Ram drag, lb_f
FNMB	Calculated net thrust momentum balance, lb_f
FNS	Measured net thrust scale force, lb_f
g_c	Dimensional constant, 32.174 lb_m-ft/lb_f-sec^2
H	Enthalpy, Btu/lb_m
HPE	Horsepower extracted, hp
h_L	Lower heating value of fuel, Btu/lb_m
J	Mechanical equivalent of heat, 778.3 ft-lb_f/Btu
L	Length, ft
M	Mach number
N	Mechanical rotor speed, rpm

*The symbols in this nomenclature were made to agree with the nomenclature in the Engine Specification (E-2054, Ref. 6) as far as possible. Where there was no guide in Ref. 6, terms were used that are consistent with current program usage.

P	Total pressure, psia
PCN	Percent rotor speed
PCN/RT	Percent corrected rotor speed
PR	Relative pressure ratio
PS	Static pressure, psia
Q	Heat rate, Btu/hr
R	Gas constant for air, 53.34 ft-lb_f/lb_m-°R
RAM	Ram recovery factor
RF	Thermocouple recovery factor
RN	Reynolds number
RNI	Reynolds number index
SFC	Specific fuel consumption, $\frac{lb_m\text{-fuel/hr}}{lb_f\text{-net thrust}}$
T	Total temperature, °F or °R
TS	Static temperature, °F or °R
V	Velocity, ft/sec
W	Weight flow, lb_m/sec or lb_m/hr
WF	Fuel flow, lb_m/hr
WHF	Hydraulic fluid flow, lb_m/hr
β	Compressor variable stator angle, deg
γ	Ratio of specific heats, c_p/c_v
δ	Relative pressure, (P2/14.696)
ϵ	Emissivity ratio
θ	Relative temperature, (T2/518.67)
μ	Viscosity, lb_m/ft-sec
ρ	Density, lb_m/ft^3

SUFFIXES

C	Cooling
D	Adjusted to calculated altitude and Mach number conditions

H	Corrected for thermal growth
HF	Hydraulic fluid
I	Isentropic
NE	Nozzle shroud external
O	Ambient conditions at desired test altitude
SP	At specification condition
X	Calculated
*	Corrected to sea-level static conditions

SUBSCRIPTS

eng	Engine
i	Indicated
o, cell	Test cell conditions
X	Calculated

STATIONS

00	Airflow measuring venturi inlet
1N	Airflow measuring venturi throat
1D	Venturi discharge
LS	Labyrinth seal cavity
1	Primary air supply duct
2	Compressor inlet
2P	Test cell plenum
3	Compressor discharge
31	Burner inlet
39	Burner discharge
4	Turbine inlet after WC3 is added to the stream
5	Turbine discharge before WC4 is added to the stream
51	Turbine discharge after WC4 is added to the stream

52	Tailpipe inlet
7	Tailpipe exit
8	Primary nozzle throat
9	Ejector exit
SS	Secondary air supply duct
17	Secondary nozzle inlet

SECTION I
INTRODUCTION

(C) The J97-GE-3 power plant is a single-spool, nonafterburning, turbojet engine designed for optimum performance at very high altitudes. Five altitude development tests of this engine have been conducted previously at AEDC (Refs. 1 through 5). The manufacturer's identification for this engine was GE1 before it was designated J97.

(C) The purpose of the test program was to conduct an official engine performance qualification test at all of the guarantee flight conditions listed in Table II of the Engine Specification (Ref. 6). Because of a second-stage turbine disk failure during testing at N + 5000 ft, the low altitude portion of the test program was not completed.

(C) This report (Part I) presents the engine thrust, specific fuel consumption, exhaust gas temperature, airflow, and rotor speed adjusted to specification conditions for three guarantee flight conditions (36, 089 ft at Mach 0. 60, N ft at Mach 0. 80, and N + 5000 ft at Mach 0. 85) plus one additional condition (N - 10, 000 ft at Mach 0. 80) which is not a guarantee point. The data are compared with the engine guarantees in Table II of the specification (Ref. 6). Some additional information is presented on engine operating experience, lube system heat rejection, and engine stall margin.

(C) The results of an engine endurance test, conducted at AEDC during May 1968, will be covered in a second report (Part II) to be published at a later date.

SECTION II
APPARATUS

2.1 TEST ARTICLE

(C) The YJ97-GE-3 engine (Fig. 1, Appendix I) used for this investigation is an axial-flow, nonafterburning, single-rotor turbojet incorporating variable stators, a two-stage turbine, a tailpipe with a 7-deg canted aft section, and a fixed-area converging nozzle. The engine utilizes a secondary air ejector nozzle designed to increase engine thrust. The engine has a thrust-to-weight ratio of 6:1 at a maximum thrust rating of 4400 lb_f at sea-level static conditions. The dry weight of the engine (including tailpipe and secondary nozzle) is 739 lb, overall cold length is 109. 5 in., and inlet diameter is 20. 1 in.

(C) The compressor is a 14-stage unit with a pressure ratio of 13.5:1 and an airflow of 70.4 lb/sec at 13,650 rpm at sea-level static operation. The inlet guide vanes and first five stator stages are integrally variable and scheduled as a function of compressor rotor speed and compressor inlet temperature. The forward frame assembly includes the inlet guide vanes, forward bearing and support struts, and a drive for the engine gearbox. The compressor rear frame assembly includes the compressor outlet guide vanes, outer combustor casing, turbine frame, and the number 2 and 3 oil sumps.

(C) A two-stage, air-cooled turbine drives the compressor. Cooling air is bled from the compressor discharge and admitted to the turbine section for cooling of the first- and second-stage stators, the first-stage rotor, and the second-stage wheel.

(C) An annular combustor is attached at the forward end of the compressor rear frame by bolts through the rear frame. Eighteen fuel nozzles are flange mounted to the compressor rear frame and extend into the combustor inlet centered in the combustor inlet swirl cups. The fuel nozzles contain high- and low-flow spin chambers with an integral scheduling valve which proportions the flow to each spin chamber.

(C) The ignition system consists of a power source, leads, and two igniter plugs. The system is a noncontinuous capacitor discharge type with a rating of 4 (min) to 10 (max) joules. The minimum spark rate is 2 sparks/sec/plug at an input voltage of 115 volts at 400 Hz.

(C) The primary exhaust section for this test (Fig. 2a) was comprised of a canted tailpipe and a 139-in.^{2} fixed-area conical exhaust nozzle. The tailpipe and centerbody at the turbine discharge form an annular diffuser which terminates 17.2 in. from the diffuser inlet in a full cylindrical cross section. Eleven, long-chord, antiswirl, airfoil-shaped struts are located in the diffuser. The cylindrical section is canted 7 deg beginning at a point 34.8 in. from the tailpipe inlet.

(C) The secondary nozzle system (Fig. 2b) is comprised of three cascaded, concentric nozzles of different discharge areas. Secondary concentric nozzle areas were: first stage, 175.5 in.^{2}; second stage, 188.2 in.^{2}; and third stage, 203.2 in.^{2}.

(U) The main fuel pump is mounted on and driven by the engine gearbox and in turn drives the main fuel control (MFC) which is tandem mounted on the pump. The main fuel pump is a two-element unit containing a centrifugal boost element and a single-stage, vane-type, high-pressure element.

(U) The fuel control is an isochronous-type hydromechanical unit which limits acceleration, steady-state, and decelerating fuel flows; limits speed as a function of compressor inlet temperature and compressor discharge static pressure; limits maximum exhaust gas temperature; and controls stator vane position by regulated fuel servo-pressure to the fuel-operated, stator vane hydraulic actuators.

(U) The main lube pump is a positive displacement type with engine, customer, and scavenge units. The lube system incorporates an auxiliary water-oil cooler in series with the engine mounted fuel-oil cooler to maintain the lube oil temperature below the 300°F specification operating limit. The auxiliary oil cooler was not used during this test because the oil temperature did not reach the 300°F limit without the cooler.

(U) A piston-type hydraulic pump (with an independent hydraulic system) was mounted on a customer drive pad of the engine gearbox to provide a means of extracting shaft horsepower from the engine. The back pressure on the pump discharge port was controlled with a throttling valve to obtain the desired horsepower extraction.

2.2 INSTALLATION

(U) The engine assembly was mounted on a thrust stand which in turn was flexure-mounted on a model support cart and installed in Propulsion Engine Test Cell (T-4) (Fig. 3). A detailed description of the T-4 test cell is presented in Ref. 7. The secondary nozzle with its integral air shroud was rigidly mounted on the thrust stand and aligned with the primary exhaust nozzle. The engine inlet duct extended into a zero-leakage, labyrinth-type air seal mounted on the downstream bulkhead of the engine inlet plenum. The engine inlet plenum contained two flow-straightening grids with screen overlays and a bellmoutn to ensure a smooth flow of air into the engine inlet. The primary airflow rate was measured using two critical-flow venturis located 27.5 ft upstream of the engine inlet plenum. Airflow to the secondary nozzle system was bled in from atmosphere through an 8-in.-diam pipe, and flow rates were measured using an ASME sharp-edged orifice.

(U) The lube oil tank is not engine equipment and is not engine mounted; therefore, a General Electric-supplied substitute tank was mounted on the thrust stand. The discharge from the customer port of the main lube oil pump was returned directly to the oil tank.

2.3 INSTRUMENTATION

(U) Aerodynamic pressure and temperature measurements were made at the stations shown in Fig. 4. Diagrams showing the number and type of instrumentation at each station are shown in Fig. 5.

(U) Pressure and scale force were measured with strain-gage-type transducers, and temperatures were measured with iron-constantan (IC), copper constantan (CC), and Chromel-® Alumel® (CA) thermocouples. The millivolt outputs of the transducers were recorded on magnetic tape from high-speed analog-to-digital converters and converted to engineering units and calculated performance parameters by a digital computer. Selected channels of pressure, temperature, and vibration (designated as safety parameters) were displayed in the control room and were photographically or manually recorded. A flight-type thermocouple harness for measuring turbine discharge temperature (station 55, Fig. 5) was provided with the engine, and the output was registered on a null-balance potentiometer and recorded both manually and automatically.

(U) Fuel, lube oil, hydraulic fluid, and water flow rates were measured by turbine-type flowmeters. The output signal was recorded on magnetic tape from frequency-to-analog converters and converted to flow in pounds per hour by a digital computer. Control room indication was displayed on digital electronic frequency converters from a frequency-to-shaped-waveform converter.

(U) The instrumentation ranges, recording methods, and posttest estimates of measurement uncertainty are presented in Table I (Appendix II).

2.4 CALIBRATION

(U) All pressure measuring transducers were laboratory calibrated with an NBS secondary standard pressure generator prior to usage in this program. The thrust measuring system was calibrated in place by applying known force levels to the thrust stand. The calibration forces applied to the thrust stand were generated by a hydraulic loading system. Calibration force levels were determined from load cells installed in the loading system that had been calibrated against a secondary standard. The fuel flowmeters were calibrated in place with a mass weighing system. The fuel flowmeter calibrations were performed at temperatures and pressures comparable with run conditions.

(U) After installation of the sensors in the test cell, the data acquisition systems were electrically calibrated. The pressure systems for run 3 and the thrust systems for all runs were electrically calibrated using known resistances in the circuits to simulate known pressure and force levels. The pressure systems for run 9 were pressure calibrated in place with a fused quartz Bourdon tube sensor, precision pressure gage, incorporating optical measurement of deflection and digital presentation. The thermocouple output recording systems were spanned to cover the thermocouple output voltage range, and the NBS temperature-millivolt calibration for each type of thermocouple was used for data reduction. The flowmeter data acquisition system was calibrated using selected inputs from an NBS secondary standard frequency generator to simulate flowmeter outputs. Calibration of the data acquisition systems was conducted at sea-level ambient conditions prior to each run.

SECTION III
PROCEDURE

3.1 SIMULATED FLIGHT CONDITIONS

(U) Conditioned air was supplied to the compressor inlet at the total pressure and temperature required to simulate the desired flight condition. Test cell pressure was set at the level corresponding to the desired altitude based on the geopotential measure (H) of the U. S. Standard Atmosphere (Ref. 8). One-dimensional, isentropic, compressible flow functions were used to determine the compressor inlet pressure and temperature for a desired Mach number. An engine inlet pressure ram recovery factor of 0. 99 was used for all flight conditions. The secondary nozzle inlet pressure was set at a specified percentage of the compressor inlet pressure (Ref. 6) by throttling the atmospheric inlet.

(C) Engine steady-state performance was determined over a range of Mach numbers from 0. 80 to 0. 85 a[illegible] altitudes from 40, 000 to N + 5000 ft.

3.2 FUEL AND OIL

(U) Fuel conforming to MIL-T-5624G, Grade JP-4, and oil conforming to MIL-L-7808F were used during this investigation.

3.3 DATA AND CALCULATIONS

(U) The methods used in calculating the steady-state parameters are presented in Appendix III. The tabulated steady-state test data are presented in Appendix IV. The pretest estimates of uncertainty for the most important performance parameters, based on the estimates of measurement uncertainty in Ref. 9, are presented for the unadjusted test data in Table IIa. Based on the posttest estimates of measurement uncertainty (Table I), it is estimated that the thrust and specific fuel consumption uncertainty will increase less than 0.5 percent.

(U) The steady-state test data were adjusted to specification conditions in accordance with the Memorandum of Understanding (Ref. 9). The pretest estimates of uncertainty for the most important performance parameters are presented for the adjusted data in Table IIb. The adjusted data used in this report are presented in Table III.

3.4 TEST CONFIGURATION

(U) The test article was a Bill of Materials engine with the exception of the Lube and Scavenge Pump Assembly S/N LJAMO117 which was a nonqualification part. No engine component changes were made during the test.

(C) The secondary supply piping and plenum chamber (Fig. 2b) were fabricated for the test to simulate flight conditions at the inlet to the secondary nozzle and are not part of the flight hardware. Between runs 6 and 7, a flight-type thermal insulating blanket was installed around the engine tailpipe to reduce thermal radiation losses. This blanket was in place for all of the official high altitude (N - 10,000 to N + 5000 ft) testing, but was not in place for the 40,000-ft operation (run 3).

SECTION IV
RESULTS AND DISCUSSION

(C) Testing of J97-GE-3 engine (S/N E447007) was divided into two parts: unofficial and official. The first six runs (the unofficial part) were system and performance check runs and included the data obtained at 40,000 ft, Mach 0.80. The engine flight envelope with the planned and actual test conditions (official part) indicated is presented in Fig. 6.

(C) The test at 40, 000 ft (run 3) was conducted to check out the instrumentation. Plans called for the low altitude guarantee points (36, 089 ft and below) to be obtained after the high altitude performance conditions were completed. Because of the turbine failure, the low altitude data were not obtained and the 40, 000-ft, Mach 0. 80 data, obtained during the checkout, were adjusted to the 36, 089-ft, Mach 0. 60 specification guarantee condition using the methods described in the Memorandum of Understanding (Ref. 9).

(C) When the performance checkout runs indicated poorer engine performance than expected at N and N + 5000 ft, it was proposed that the tailpipe thermal insulating blanket (normally installed in the flight vehicle) be installed on the engine. This was done prior to run 7, and the run 7 results indicated an appreciable performance improvement. The official test (run 9) was then conducted with the insulating blanket installed on the engine. Run 8 data were not valid and are, therefore, not included in the report.

(C) This report presents the engine thrust, specific fuel consumption, exhaust gas temperature, airflow, and rotor speed adjusted to specification conditions for three guarantee flight conditions (36, 089 ft, Mach 0. 60; N ft, Mach 0. 80; and N + 5000 ft, Mach 0. 85). Data for one additional condition (N - 10, 000 ft, Mach 0. 80), which is not a guarantee point, are also included. The data are compared with the engine guarantees in Table II of the specification (Ref. 6). Some additional information is presented on engine operating experience, lube system heat rejection, and engine stall margin.

4.1 OPERATIONAL EXPERIENCE

(C) A summary of engine E447007 operating times during the AEDC test reported herein is contained in Table IV. Total engine operating time for the test was 28 hr and 34 min. With the exception of the turbine failure which terminated the test, no significant engine operating difficulties were encountered. The maximum observed vibration levels on the compressor front and rear frames (Table IV) were 1. 7 and 2. 6 mils, respectively, which were well below the respective 4- and 6-mil limits.

(C) A summary of engine altitude windmill starts made during the test is presented in Table V. To supplement the information available on engine E447007, a summary of the starts made on YJ97-GE-3 engine S/N E447051 during a preceding test at AEDC (Ref. 5) is included. All starts attempted on both engines were successful; the maximum altitude at which starts were attempted was 35, 000 ft. It should be noted that a systematic altitude start investigation was not conducted.

(C) A summary of engine flameout experience on engines E447007 and E447051 (Ref. 5) in the T-4 test cell at AEDC is presented in Table VI. No flameouts occurred during steady-state operation of engine E447051. Three flameouts were encountered with engine E44705 during transition between altitude test points. The conditions at which these flameouts occurred are listed in Table VI. During testing of engine E447007, compressor discharge pressure was maintained at a level of 10 psia or greater during transition between altitude test points (to prevent engine flameout), and no flameouts occurred. A systematic flameout investigation was not attempted.

(C) The YJ97-GE-3 engine (S/N 447007) steady-state compressor operating pressure ratio as a function of rotor speed is presented in Fig. 7 for two altitude test conditions. An indication of the compressor stall margin can be obtained by comparing these data with the stall line obtained during the test of J97 engine S/N E424005/2 (Ref. 4). The indicated stall margin at these altitude conditions decreased from approximately 6 percent at 14,400 rpm to approximately 3.5 percent at 14,000 rpm.

(C) Engine S/N E447007 was operated with 80°F fuel at the engine fuel pump inlet and with no cooling water flow through the auxiliary water-oil cooler during all testing at AEDC. Engine oil pump inlet temperature is presented in Fig. 8 for operation at two high altitude test conditions. The maximum oil pump inlet temperature observed during the test was 293°F.

(C) Although there was no water flow through the auxiliary oil cooler, the engine oil was circulated through the cooler, and the heat loss from the oil lines and the cooler is estimated to be 125 Btu/min. Also, the engine specification heat rejection criteria are specified for a 100°F fuel inlet temperature. If the fuel inlet temperature had been increased to 100°F, less than 100 Btu/min would have had to be removed from the oil to maintain the oil temperature below the 300°F limit at the most severe test condition (N + 5000 ft). The specification states that the maximum heat rejection required at the most severe condition (N + 5000 ft) will be 900 Btu/min; therefore, the engine heat rejection requirement at this condition is approximately 675 Btu/min below the specification limit.

4.2 ALTITUDE PERFORMANCE

(C) Engine jet thrust was determined by two methods: momentum balance and scale force (see Appendix III). A comparison of the results of the two methods is presented in Fig. 9 as a function of scale force jet thrust. The two methods agree within 2.1 percent for all of the data presented in this report. The net thrust and specific fuel consumption data obtained by both the scale force and the momentum balance methods are tabulated in Table III. The scale force data were used to calculate all performance results presented and discussed in this report.

(C) Specific fuel consumption as a function of adjusted net thrust is presented in Fig. 10 for the three guarantee altitude conditions (36,089 ft, Mach 0.60; N ft, Mach 0.80; and N + 5000 ft, Mach 0.85) and the N - 10,000-ft Mach 0.80 condition (not a guarantee point). The specific fuel consumptions at the guarantee thrust levels at 36,089, N, and N + 5000 ft were 2.2, 3.8, and 1.7 percent, respectively, less than the specification guarantee values. The maximum net thrust obtained at 36,089, N, and N + 5000 ft during the test exceeded the specification guarantee values by 2.0, 2.9, and 9.5 percent, respectively. The thrust data at N + 5000 ft (Fig. 10c) were all above the guarantee level, thus an extrapolation of the curve was required to determine the value of specific fuel consumption (and other parameters) at the guarantee thrust level. At the N - 10,000-ft condition (Fig. 10d), no data were obtained at the maximum power condition; the specific fuel consumption was approximately 0.1 percent less than the estimated performance at 105-percent corrected rotor speed. Note that the test data at this condition were obtained without the tailpipe insulating blanket installed. A slight improvement in performance would be expected if the blanket were installed.

(C) The remaining three parameters (T51, W2, and N) compared with the specification are presented in Figs. 11 through 13. The data presentation is unconventional in these figures in that thrust is presented as the independent variable to permit direct determination of the parameter value at the specification guarantee thrust level.

(C) The adjusted exhaust gas temperature versus net thrust is presented in Fig. 11 for the three guarantee conditions. The engine exhaust gas temperatures at the guarantee thrust levels at 36,089 and N ft were 5.8 and 2.1 percent, respectively, less than the specification estimated exhaust gas temperature. At N + 5000 ft, the exhaust gas temperature was 2.0 percent less than the specification estimated value.

(C) The engine rotor speed versus net thrust is presented in Fig. 12 for the three guarantee conditions. The engine rotor speeds at the guarantee thrust levels at 36,089, N, and N + 5000 ft were 3.6, 3.4, and 4.6 percent, respectively, less than the maximum values specified in Table II of the specification.

(C) The adjusted engine primary airflow versus net thrust is presented in Fig. 13 for the three guarantee conditions. The engine primary airflows at the guarantee thrust levels at 36,089 and N ft were 1.2 percent greater than the guarantee airflow in the specification. The airflow at the guarantee thrust level at N + 5000 ft was 0.7 percent less than the guarantee airflow. The airflow at all three of these conditions was well within the ±3-percent band specified in Table II of the specification.

(C) The values of all the parameters obtained from Figs. 10 through 13 at the guarantee thrust levels are presented in Table VII along with the Model Specification Table II values. Note that the specification was written for a two-position nozzle, but the test was conducted with a fixed-area (139-in.^{2}) exhaust nozzle.

SECTION V
SUMMARY OF RESULTS

(C) The most significant results of the partial qualification test of the YJ97-GE-3 engine S/N E447007 at AEDC are listed below:

1. The engine was operated without mechanical or operational difficulties for a total of 28 hr, 34 min. The test program was terminated by a failure of the second-stage turbine disk.
2. A total of 12 altitude engine starts were attempted at various simulated flight conditions during the course of testing, and all were successful. No engine flameouts were encountered during the test program.
3. The engine specific fuel consumption at the guarantee thrust values was less than the specification at all test conditions. At specified thrust at N ft, the measured specific fuel consumption was 1.21 $lb_m/hr\text{-}lb_f$, which is 4 percent less than the guarantee value.
4. The engine heat rejection is approximately 675 Btu/min less than the maximum specified value of 900 Btu/min at N + 5000-ft altitude.

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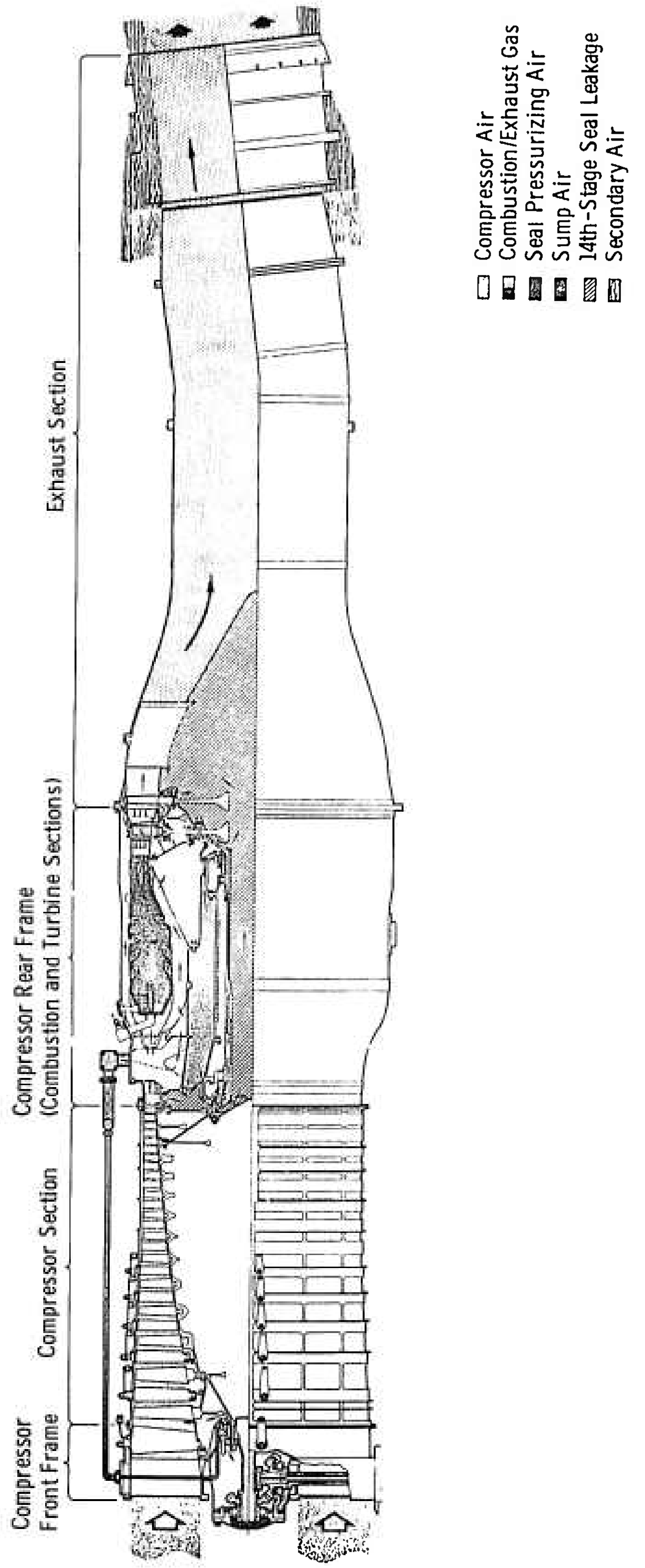
APPENDIXES

I. ILLUSTRATIONS

II. TABLES

III. METHODS OF CALCULATION

IV. TABULATED STEADY-STATE DATA



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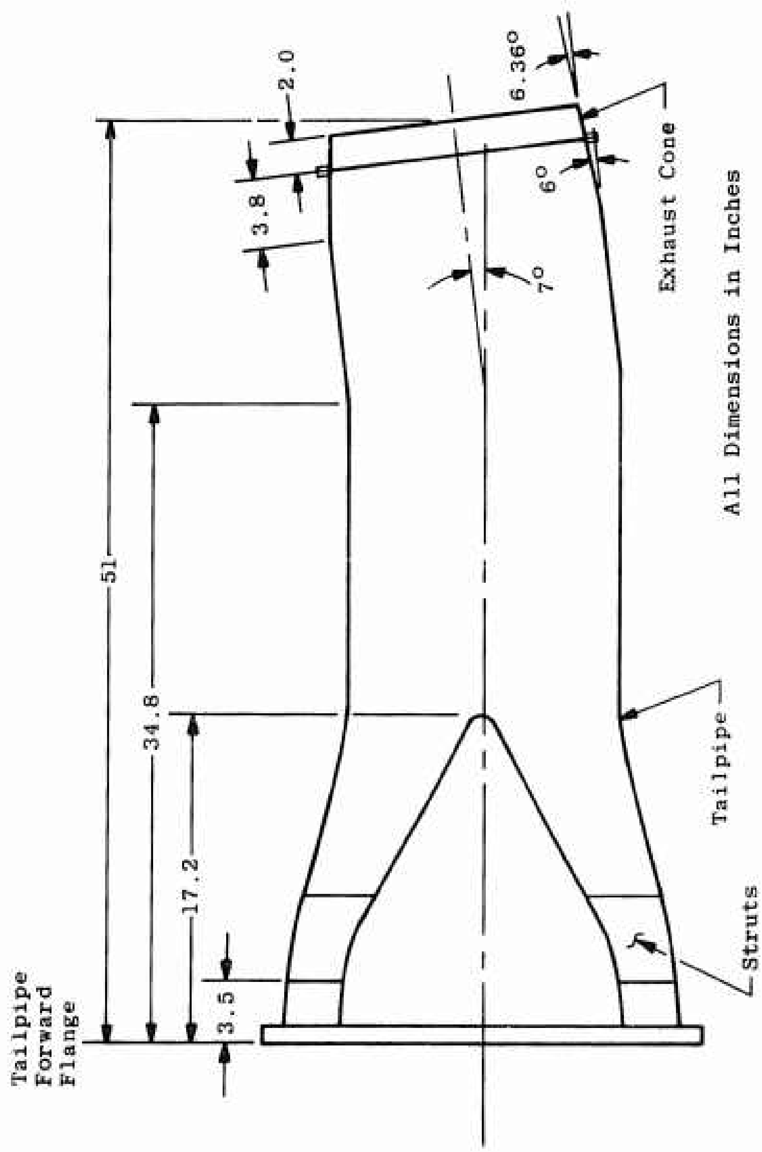
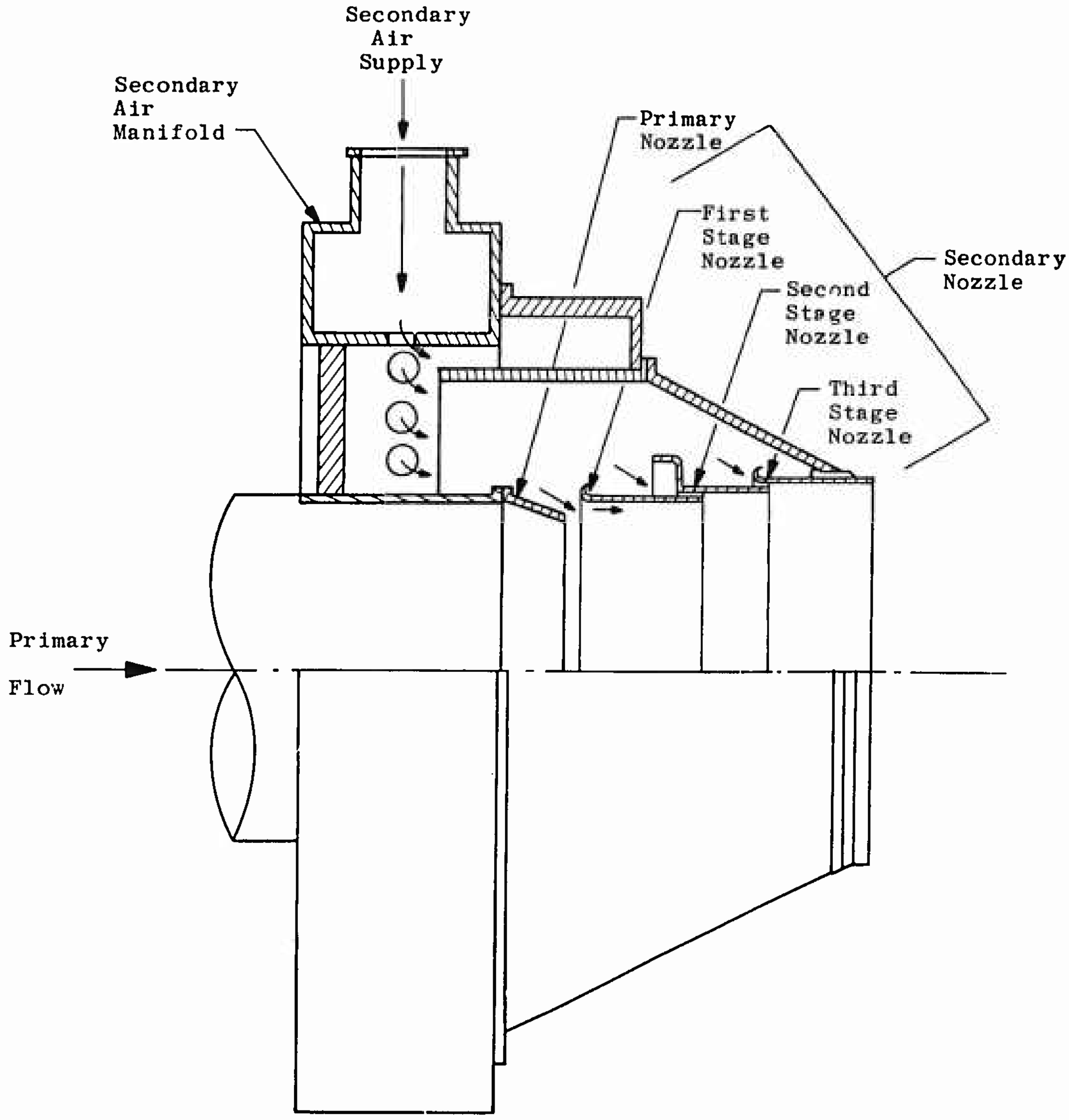
(U) Fig. 1 YJ97-GE-3 Engine Schematic

UNCLASSIFIED



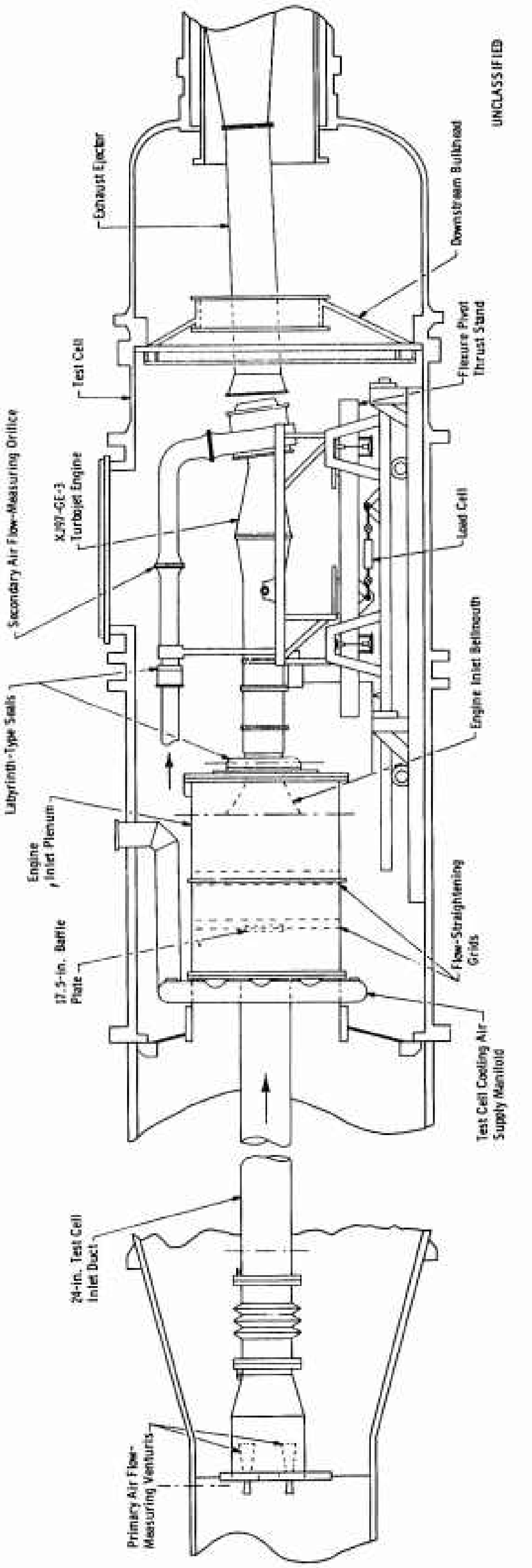
a. Tailpipe and Exhaust Cone

(U) Fig. 2 Engine Exhaust System

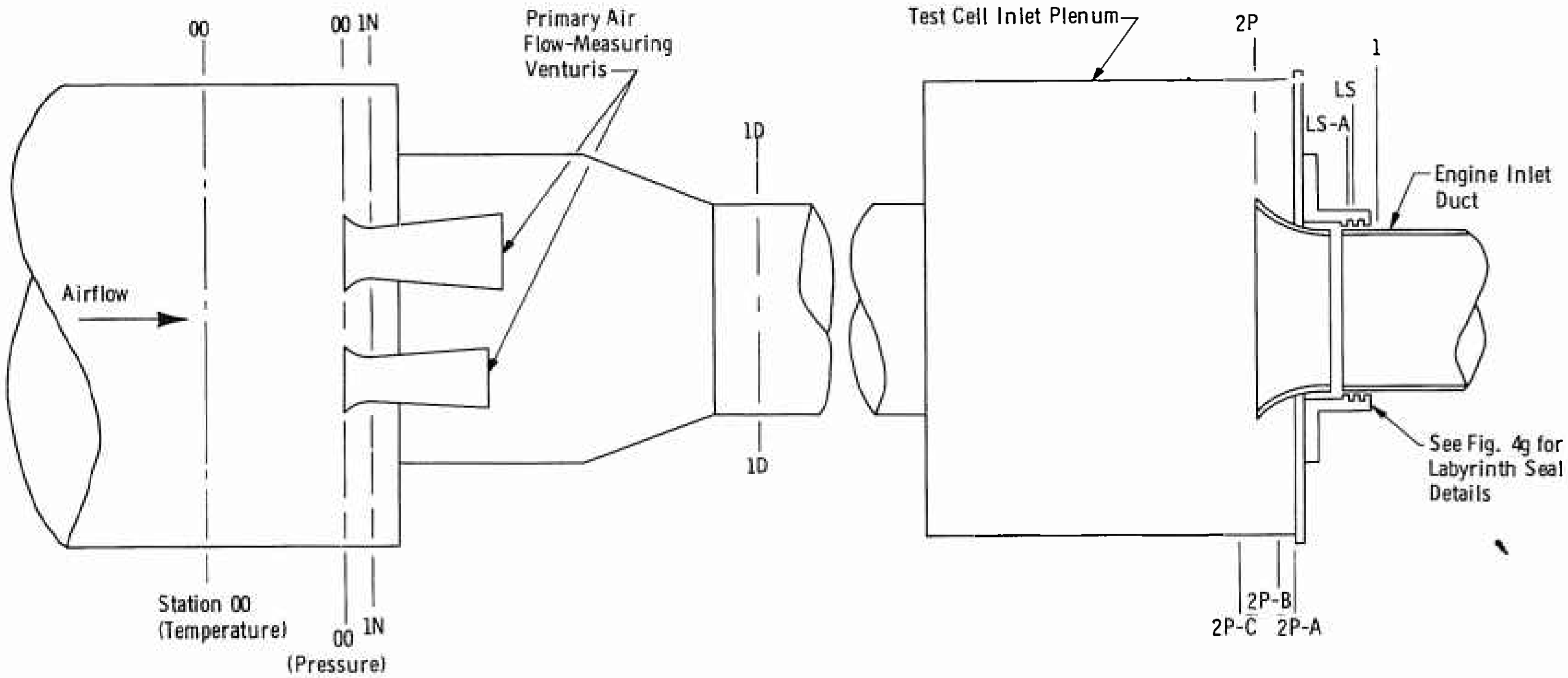


b. Secondary Nozzle System

Fig. 2 Concluded



(U) Fig. 3 Installation of the YJ97-GE-3 Turbojet Engine in Propulsion Engine Test Cell (T-4)



Station	00	1N	1D	2P	LS-A	LS	1	2P-A	2P-B	2P-C
Total Pressure	3	~	~	3		~	~	1	~	~
Stream Static Pressure	~	~	~	~	2	~	~	~	~	~
Wall Static Pressure	~	8	~	~		4	4	~	1	1
Total Temperature	6	~	6	~		~	~	~	~	~
External Wall Temperature	~	~	~	~		~	~	~	~	~

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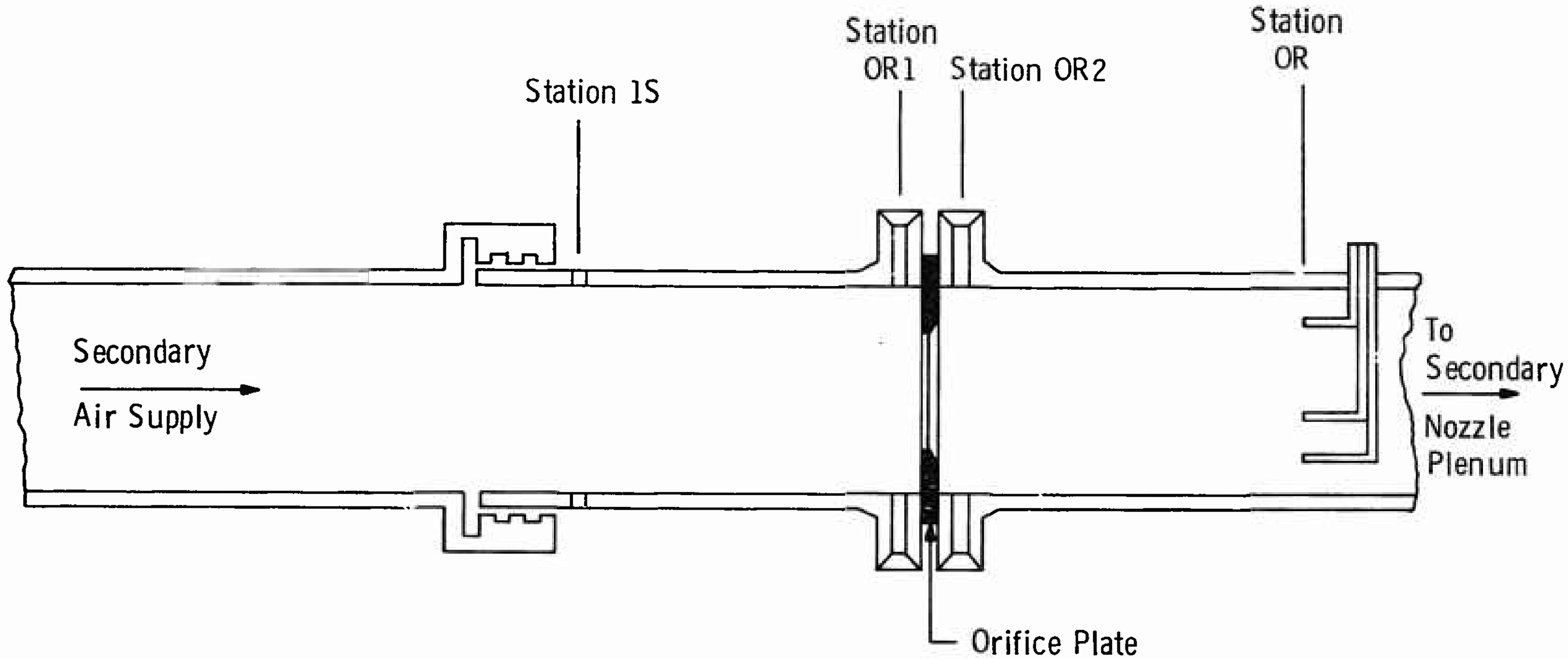
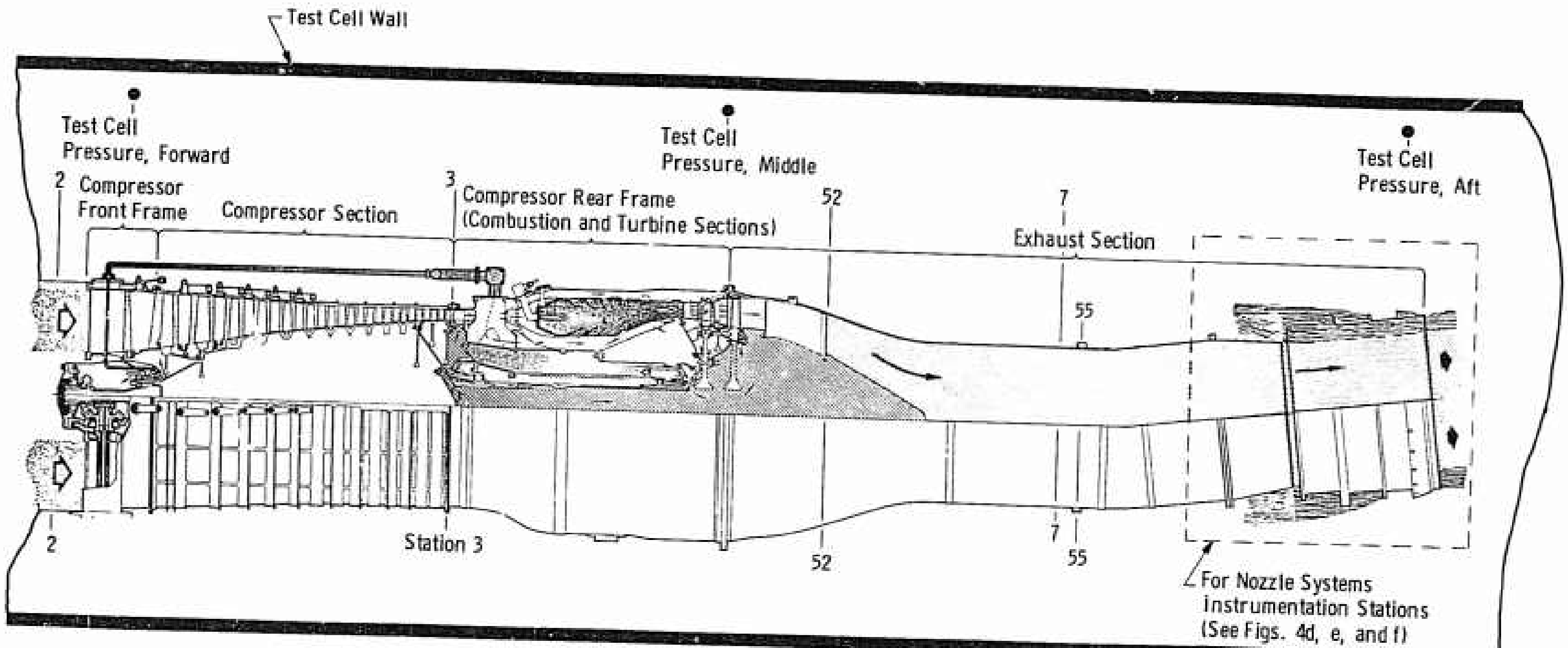
a. Primary Air Supply System

(U) Fig. 4 Instrumentation Station Locations

Station	1S	OR1	OR2	OR
Wall Static Pressure	2	~	~	~
Flange Static Pressure ,	~	2	2	~
Total Temperature	~	~	~	3



b. Secondary Air Supply System
Fig. 4 Continued



Station	2	3	52	55	7	Test Cell, Forward	Test Cell, Middle	Test Cell, Aft
Total Pressure	30	25	10	~	~	~	~	~
Stream Static Pressure	24	~	~	~	4	~	~	~
Wall Static Pressure	~	5	~	~	~	1	1	1
Total Temperature	24	25	~	16	~	~	~	~

Compressor Air
Combustion/Exhaust Gas
Seal Pressurizing Air
Sump Air
14th-Stage Seal Leakage
Secondary Air

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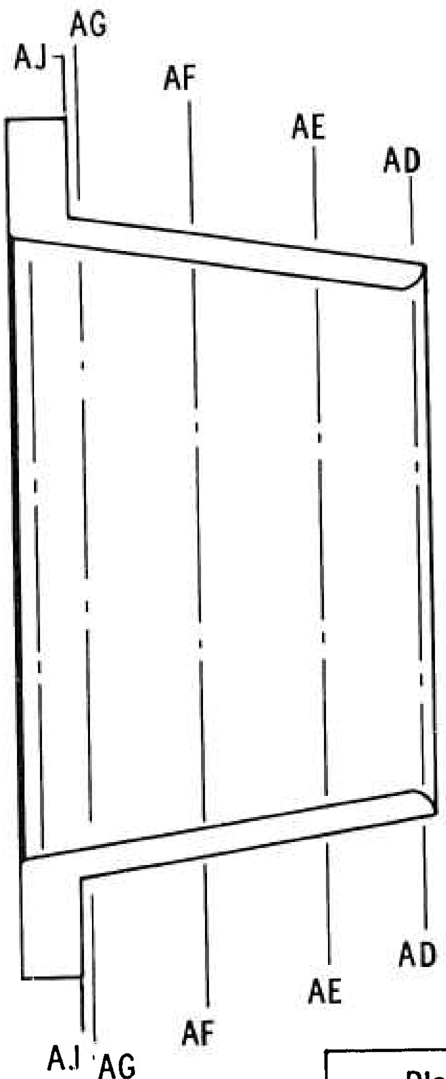
c. Engine
Fig. 4 Continued



Plane	Distance from Nozzle Exit Plane, in.
AJ	2.1
AG	2.0
AF	1.2
AE	0.5
AD	0.1

Plane	AJ	AG	AF	AE	AD
Internal Static Pressure	~	~	~	~	4
External Static Pressure	~	5	1	2	2
External Skin Temperature	4	4	~	~	4

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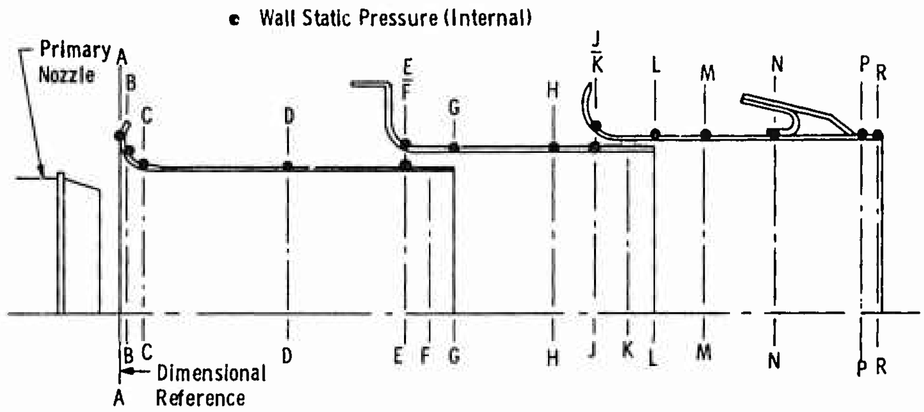
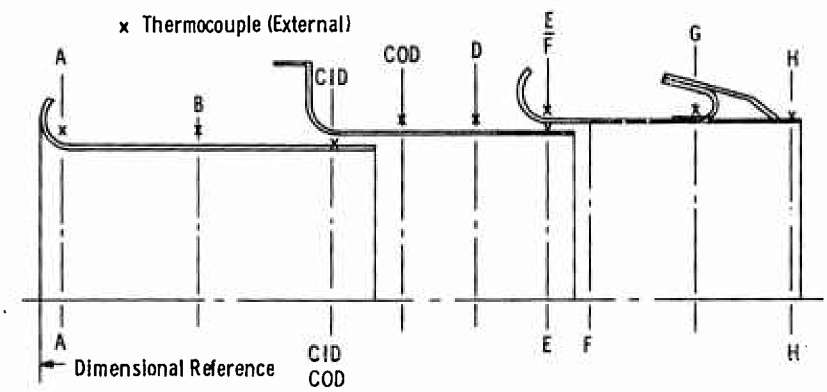
d. Primary Exhaust Nozzle Cone
Fig. 4 Continued



Plane	A	B	C	D	1st Stage	2nd Stage	G	H	2nd Stage	3rd Stage	L	M	N	P	R
Distance from Ref., in.	0	0.27	0.64	2.86	4.1	4.1	5.46	6.95	7.26	7.26	8.47	9.58	10.49	11.80	12.37

Secondary Nozzle Static Pressure Tap Locations (Planar)



Plane	A	B	CID	COD	D	E	F	G	H
Distance from Ref., in.	0.64	2.90	4.43	5.73	6.95	7.71	7.71	10.64	12.15

Secondary Nozzle Skin Thermocouple Locations (Planar)

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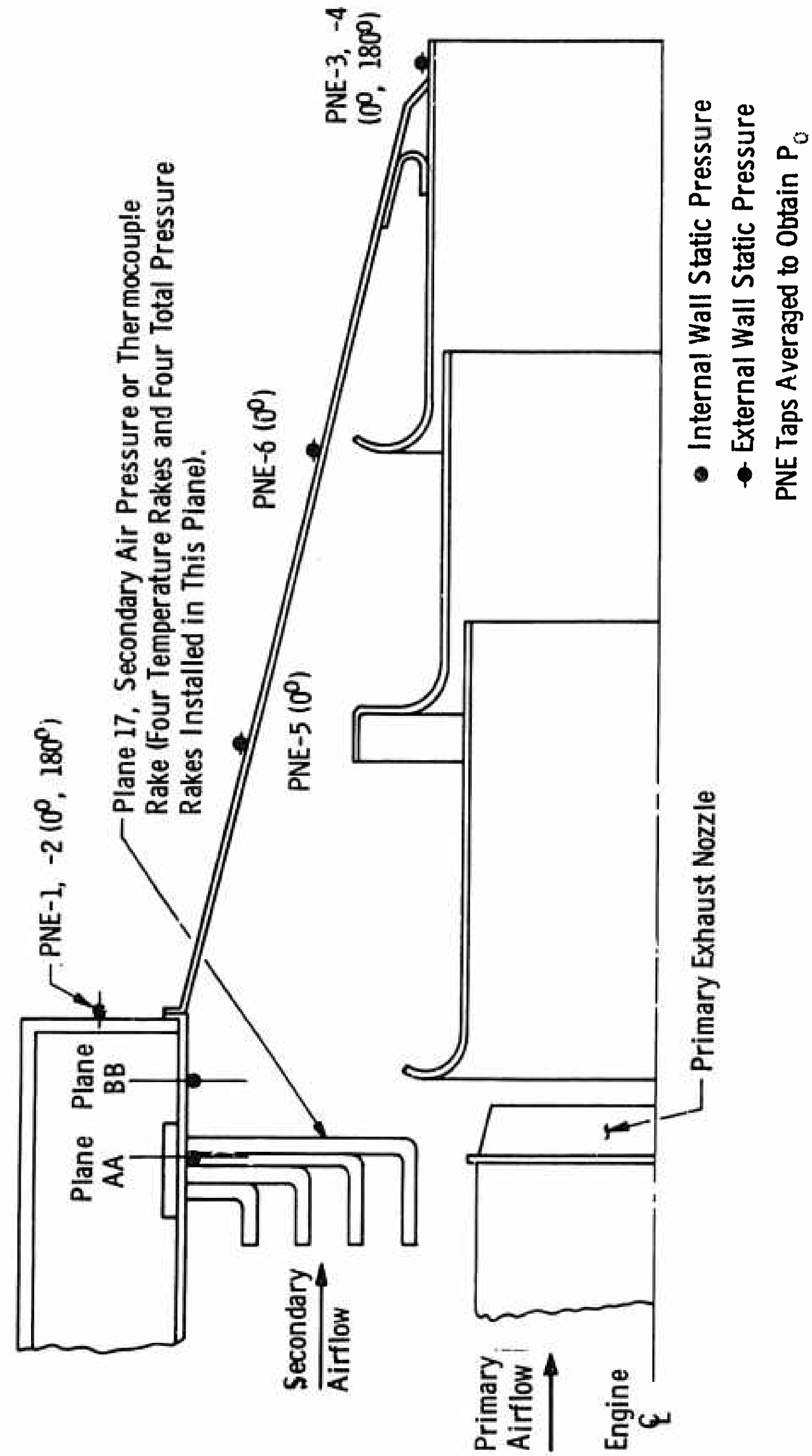
e. Secondary Nozzle

Fig. 4 Continued



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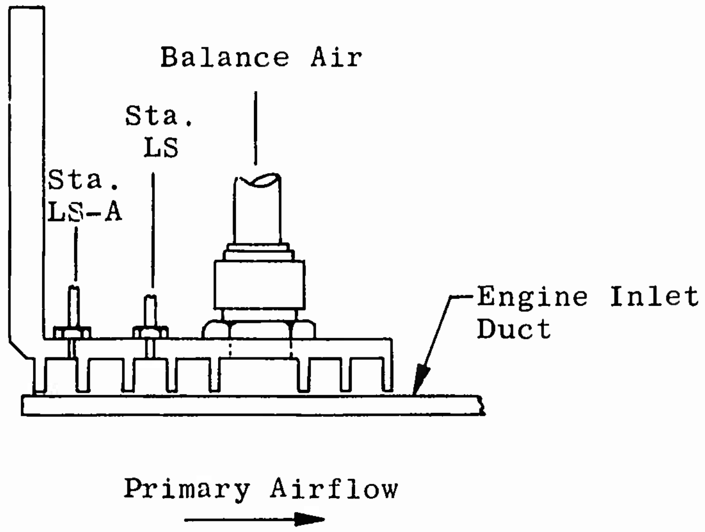
f. Secondary Air Plenum
Fig. 4 Continued



Balance Air Controlled to Maintain
Δ(PLS-PLS-A) ≈ 0

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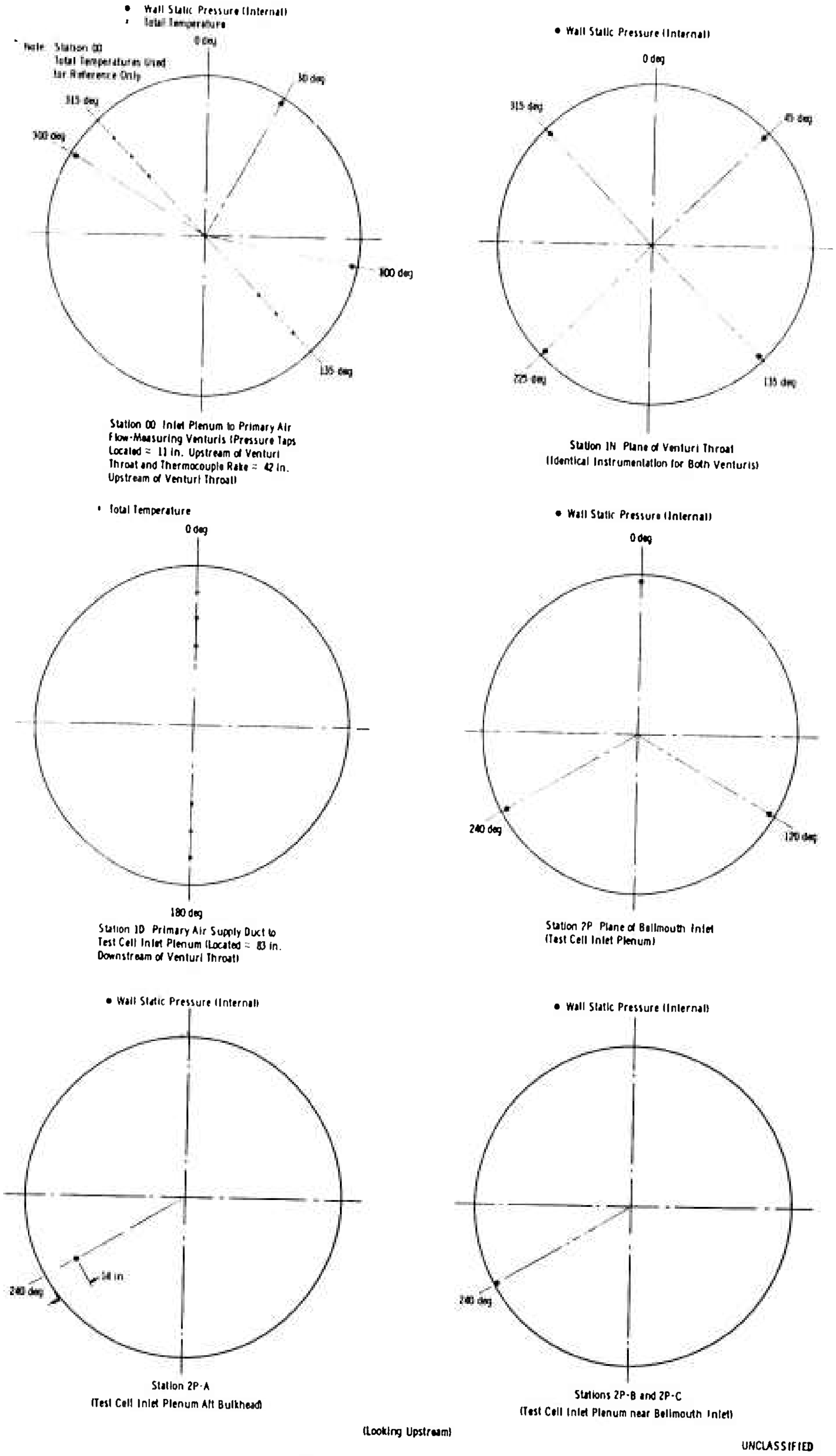
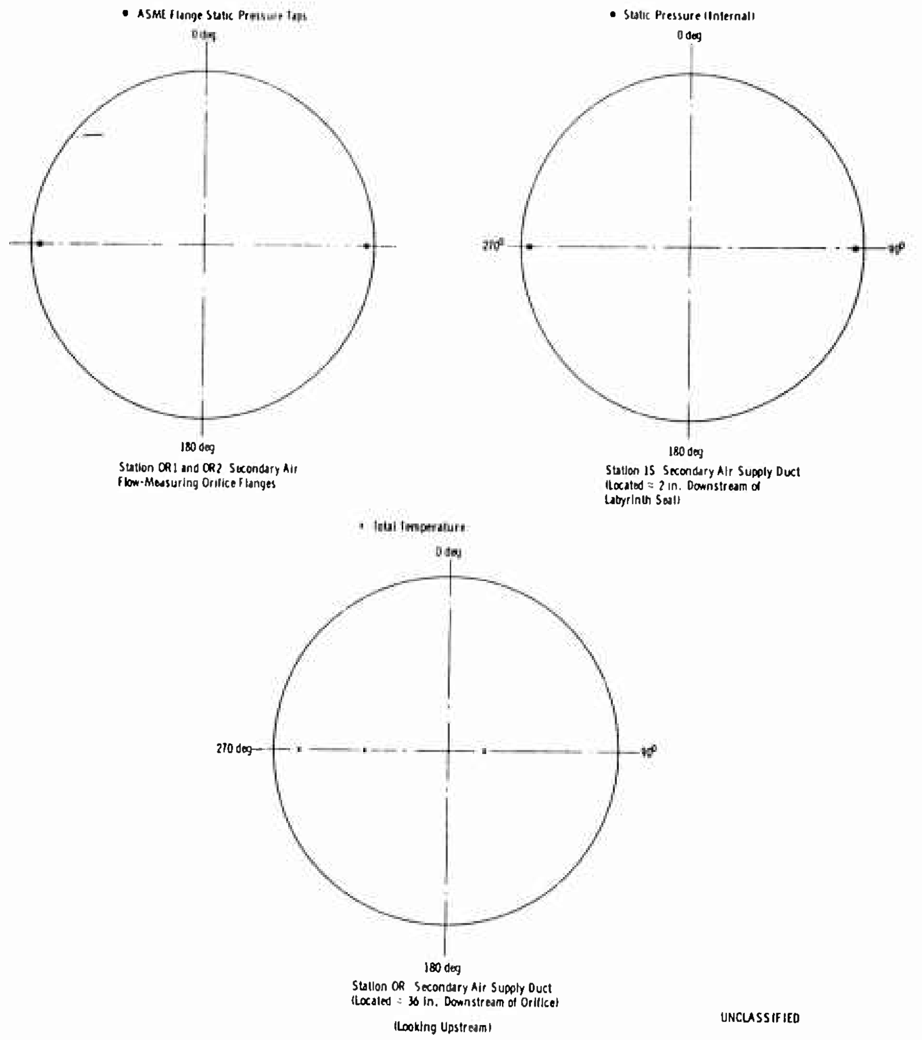
g. Engine Inlet Duct Labyrinth Seal

Fig. 4 Concluded



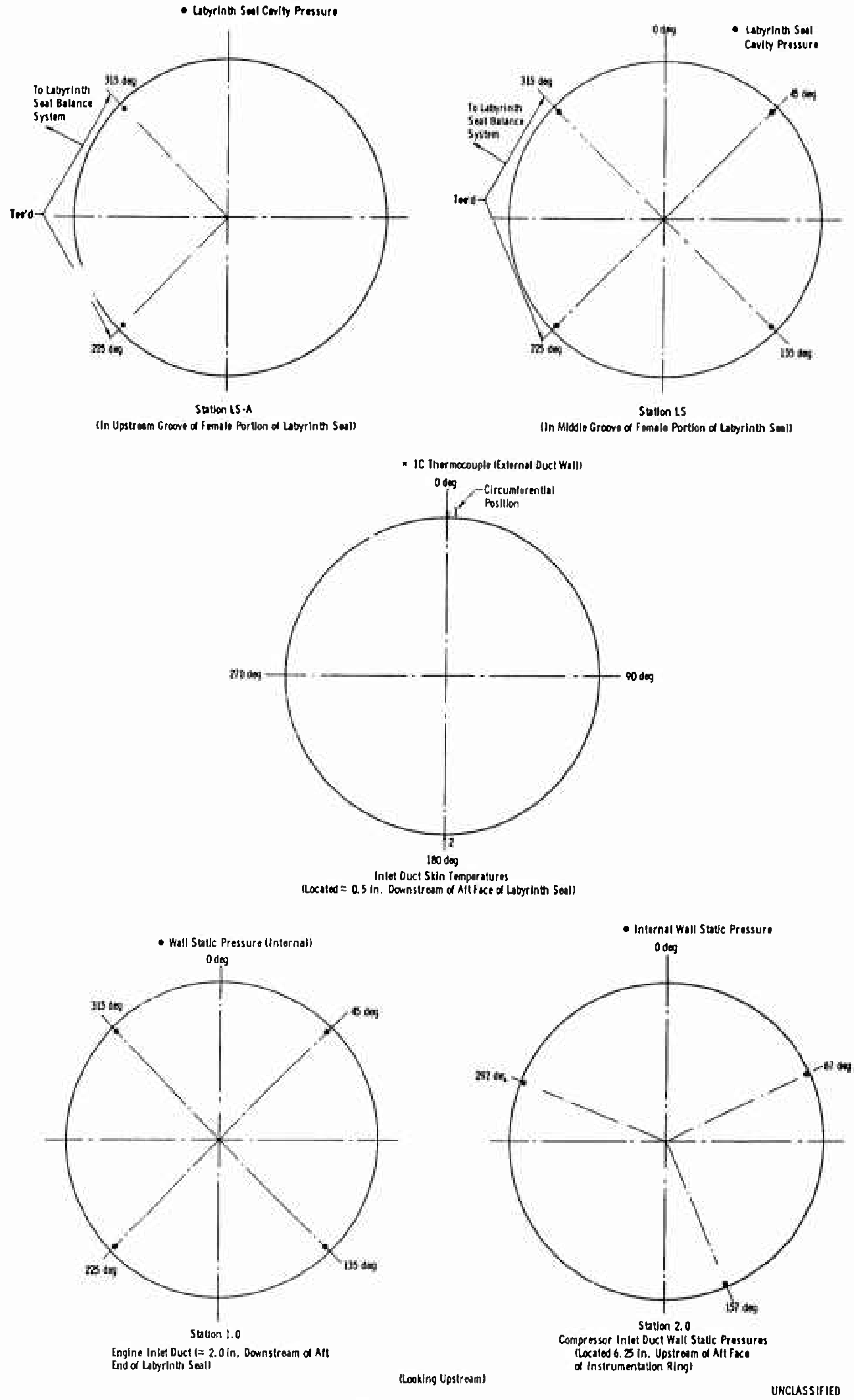
a. Primary Air Supply System

(U) Fig. 5 Instrumentation Details



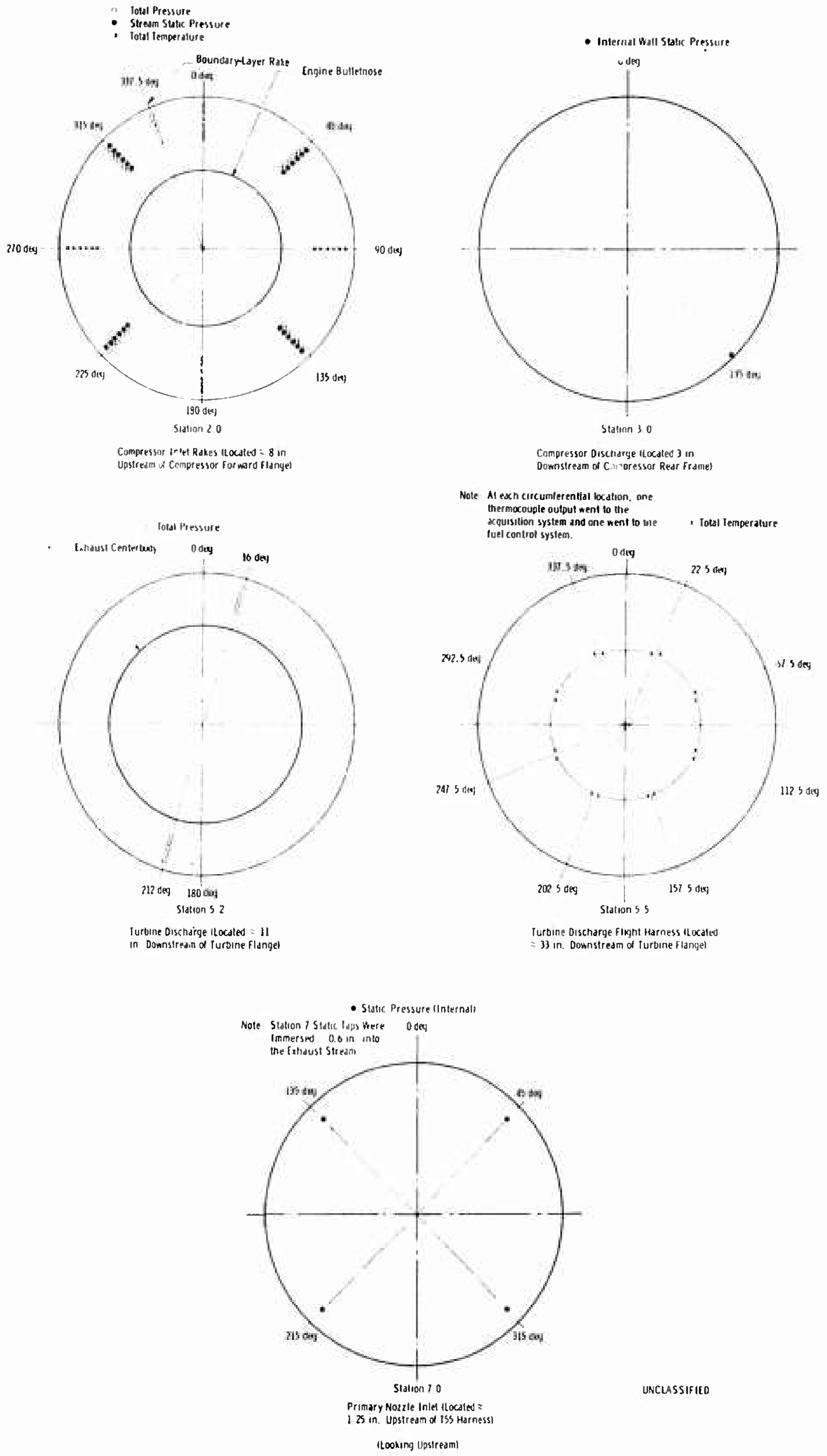
b. Secondary Air Supply System

Fig. 5 Continued



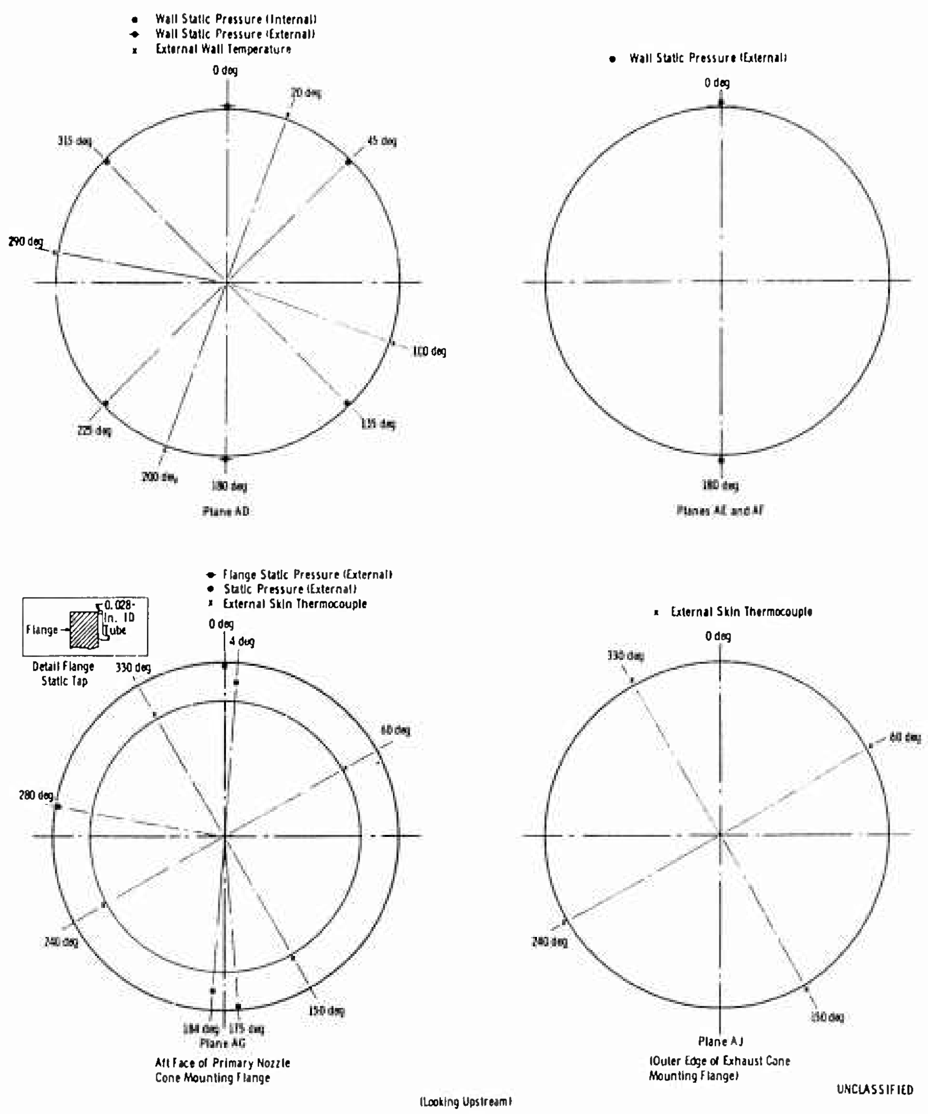
c. Engine Inlet Duct

Fig. 5 Continued

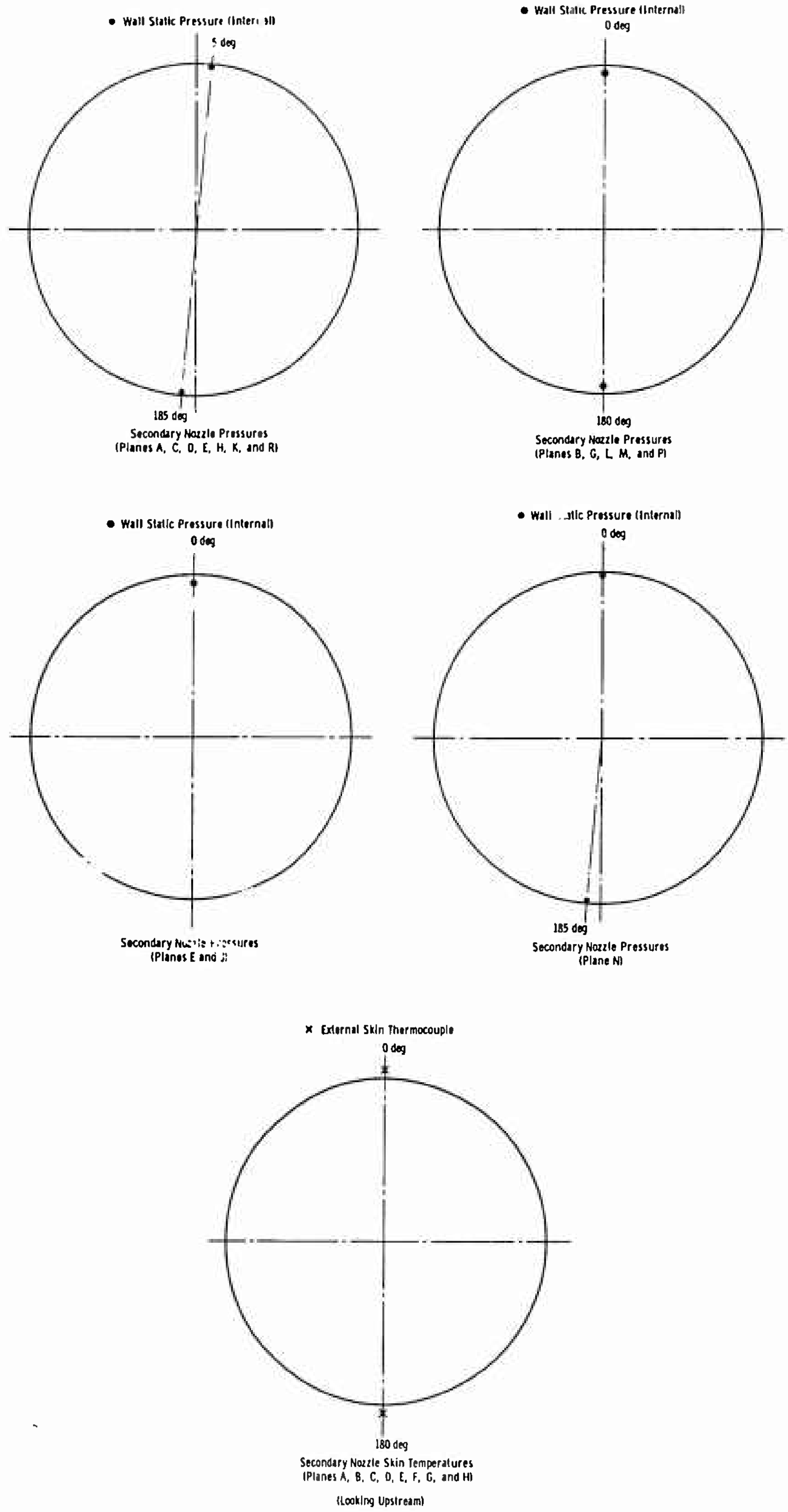


d. Engine

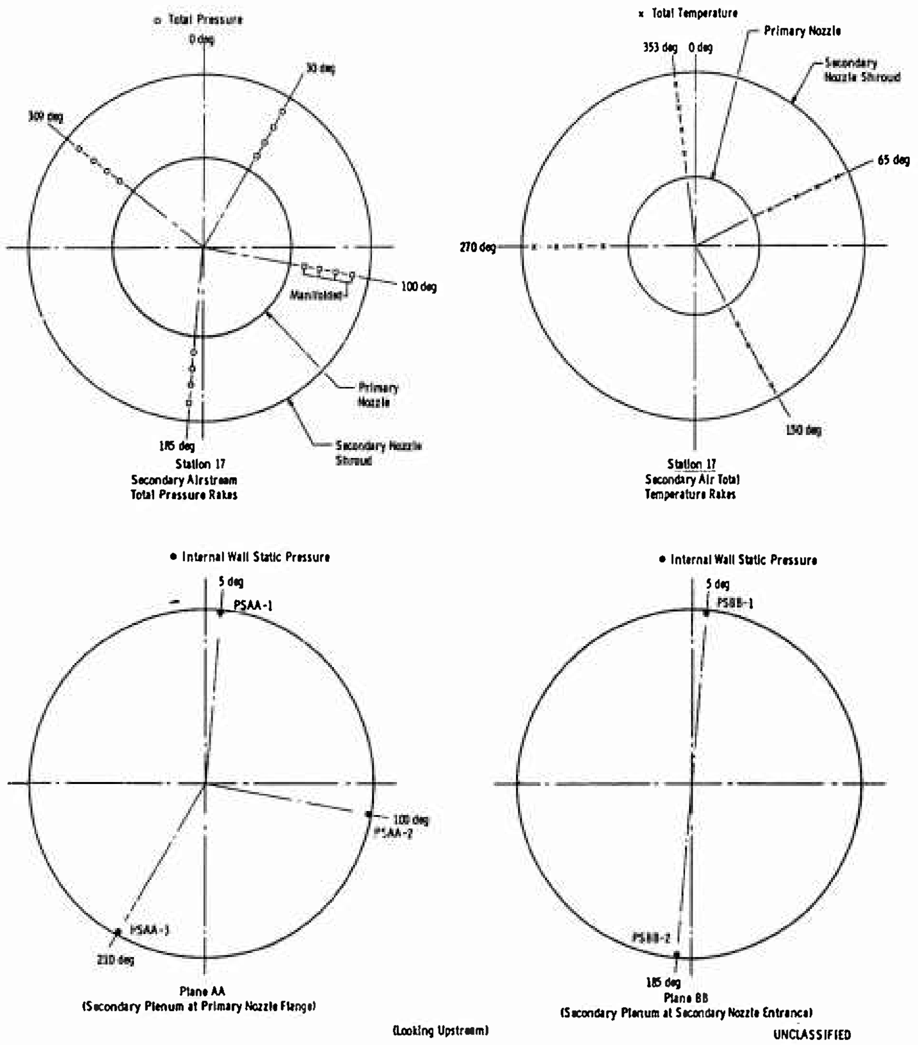
Fig. 5 Continued



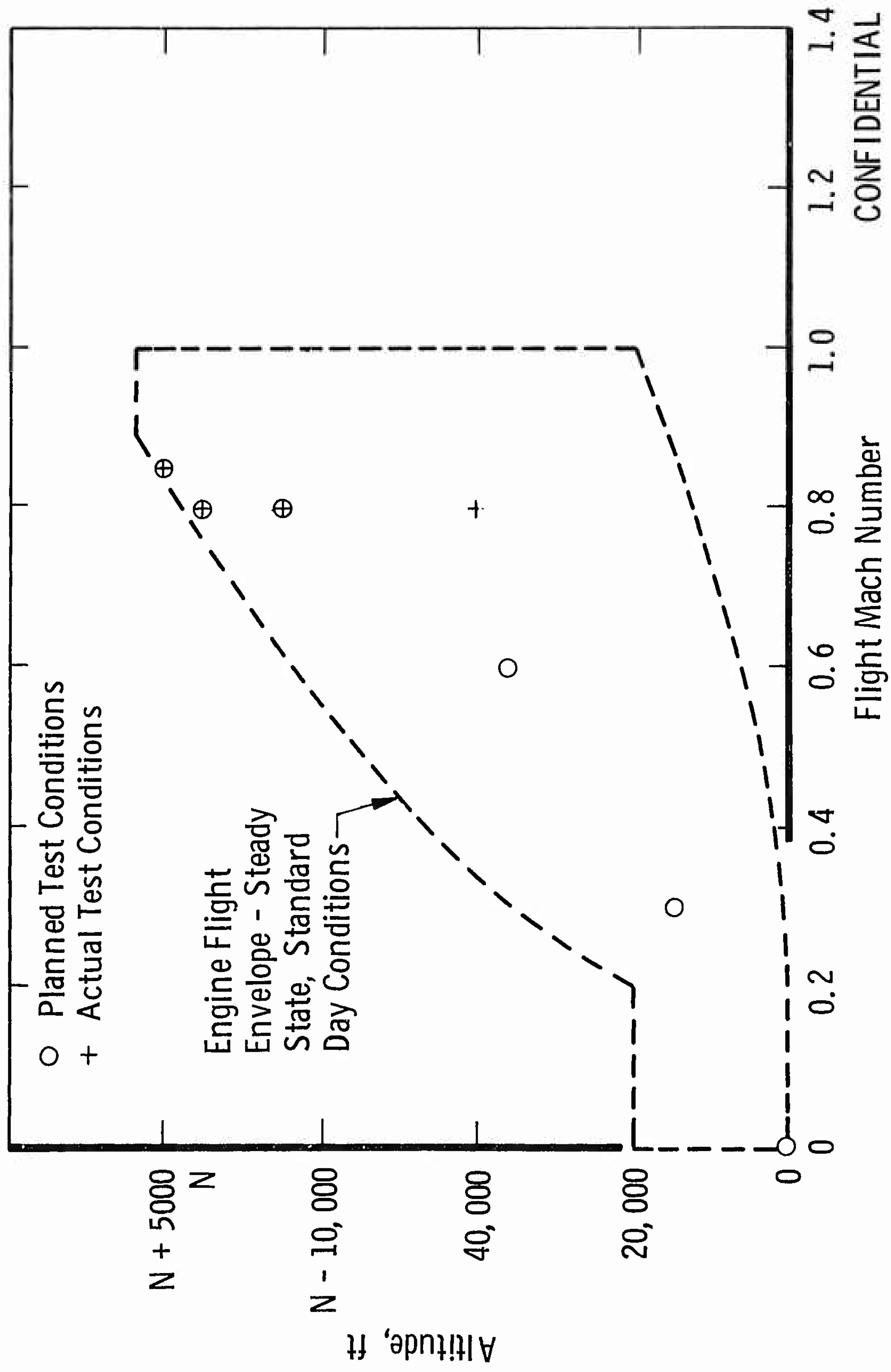
e. Primary Exhaust Nozzle Cone
Fig. 5 Continued



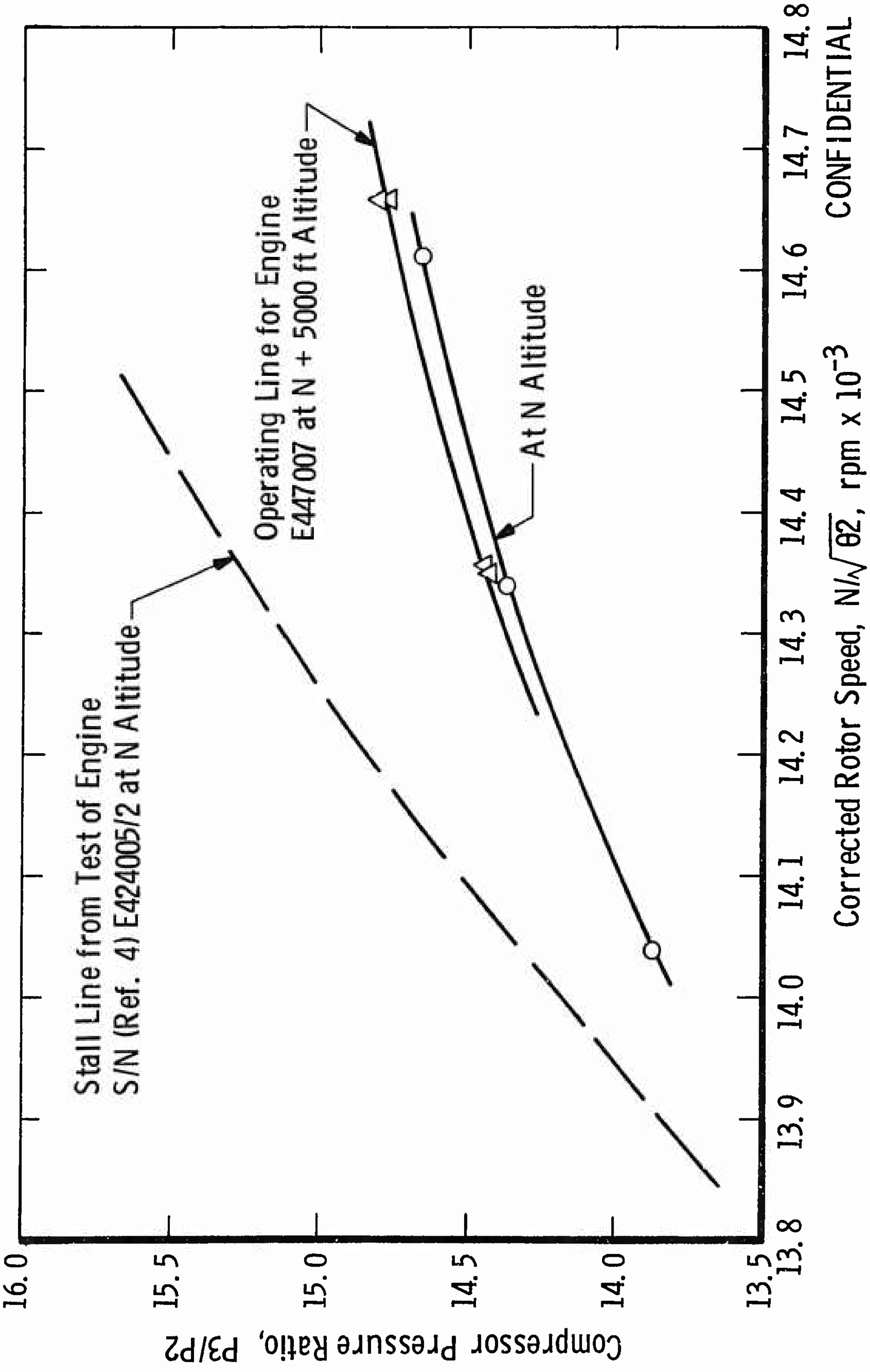
f. Secondary Nozzle
Fig. 5 Continued



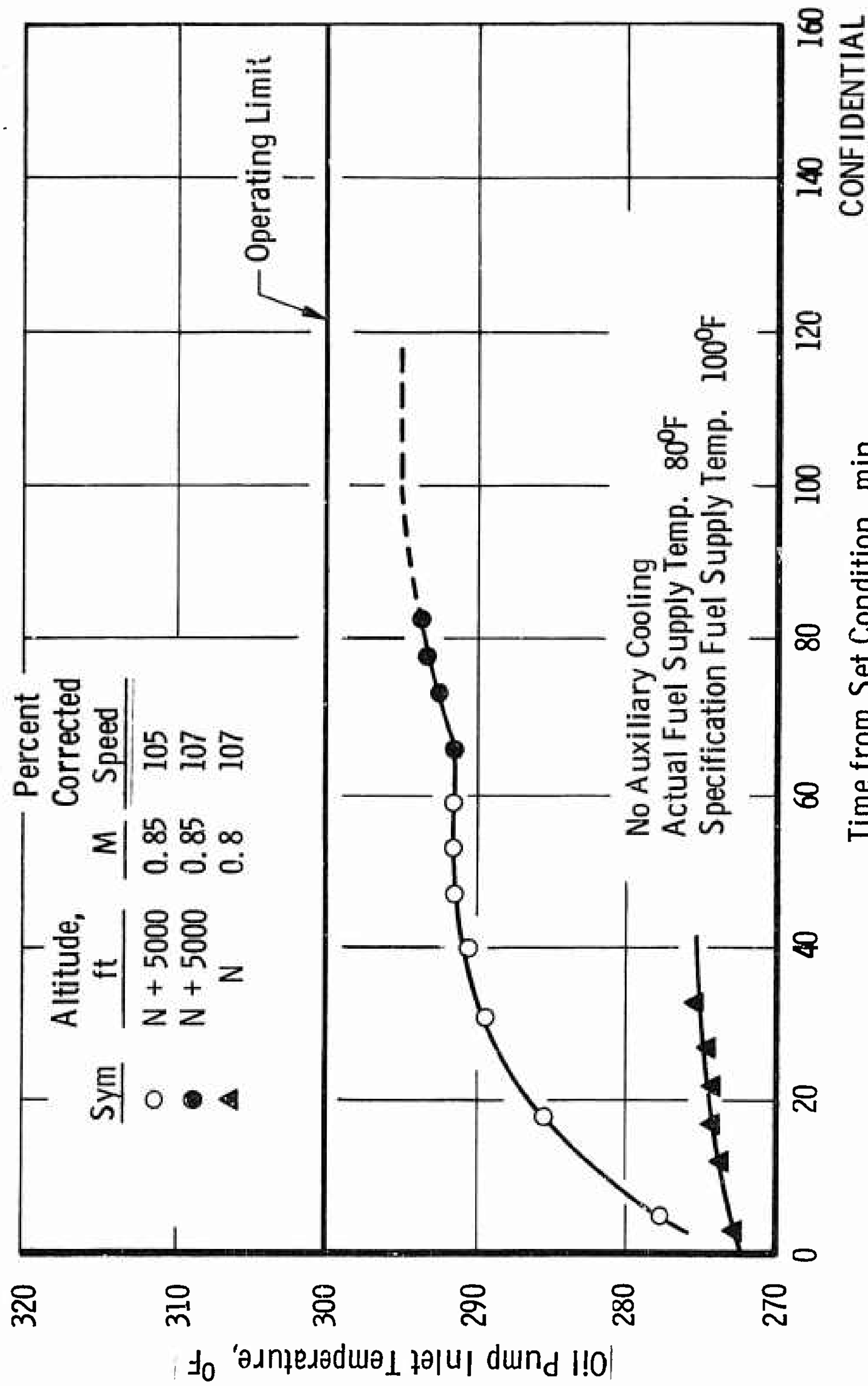
g. Secondary Air Plenum
Fig. 5 Concluded



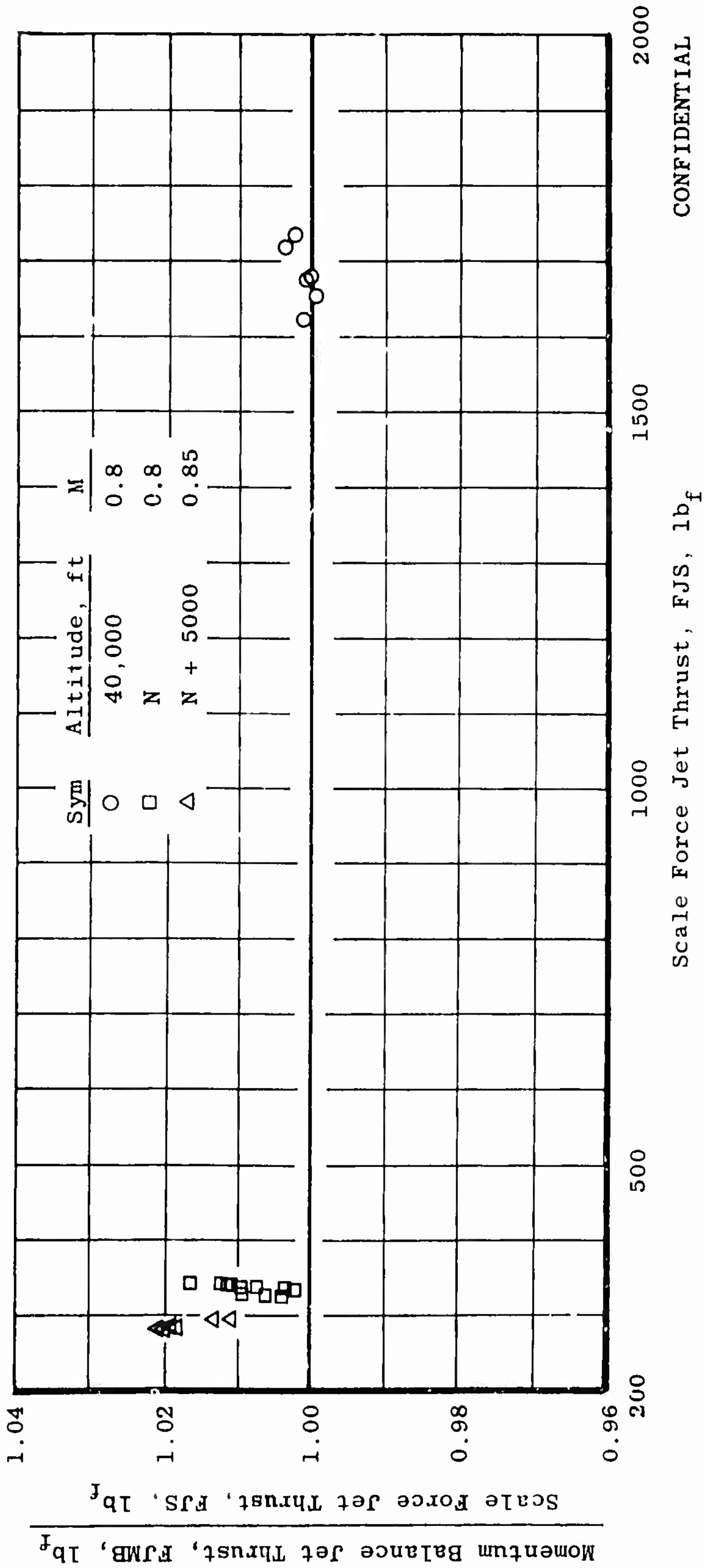
(C) Fig. 6 Planned and Actual Test Conditions for J97 Qualification Testing at AEDC



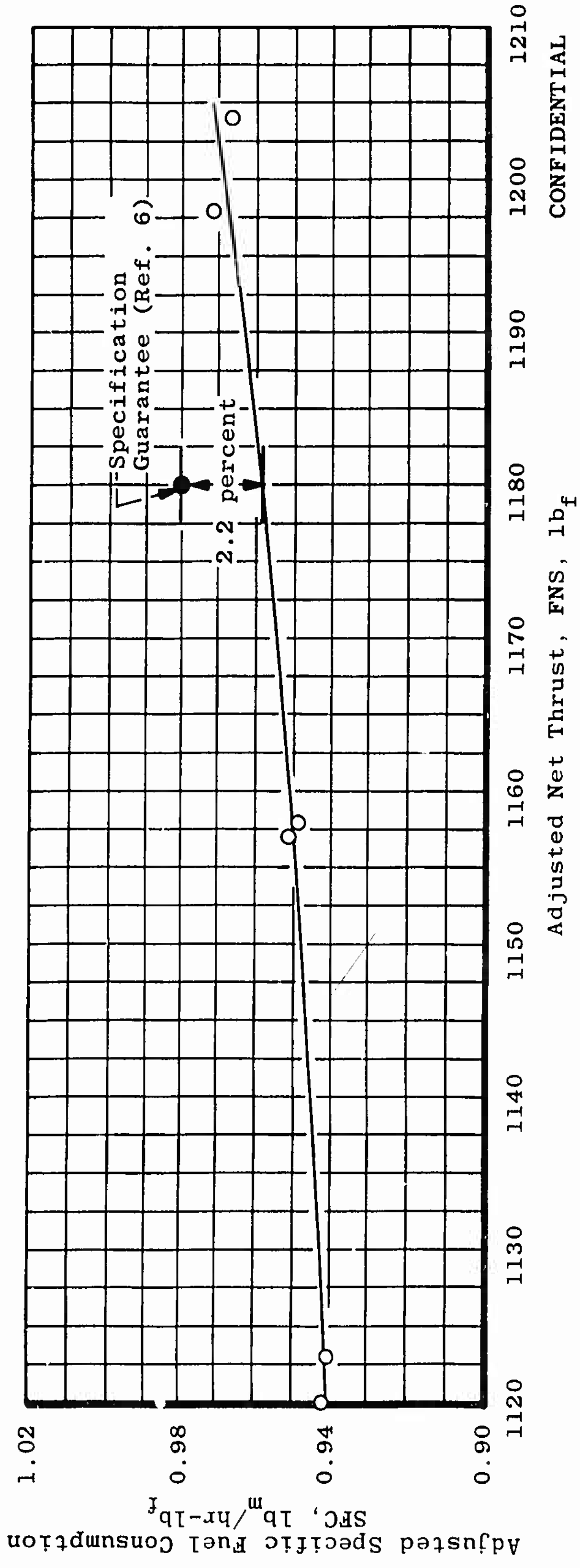
(C) Fig. 7 Operating Characteristics of Engine S/N E447007 during Qualification Testing at AEDC



(U) Fig. 8 Oil Temperature versus Engine Operating Time (Engine S/N E447007)

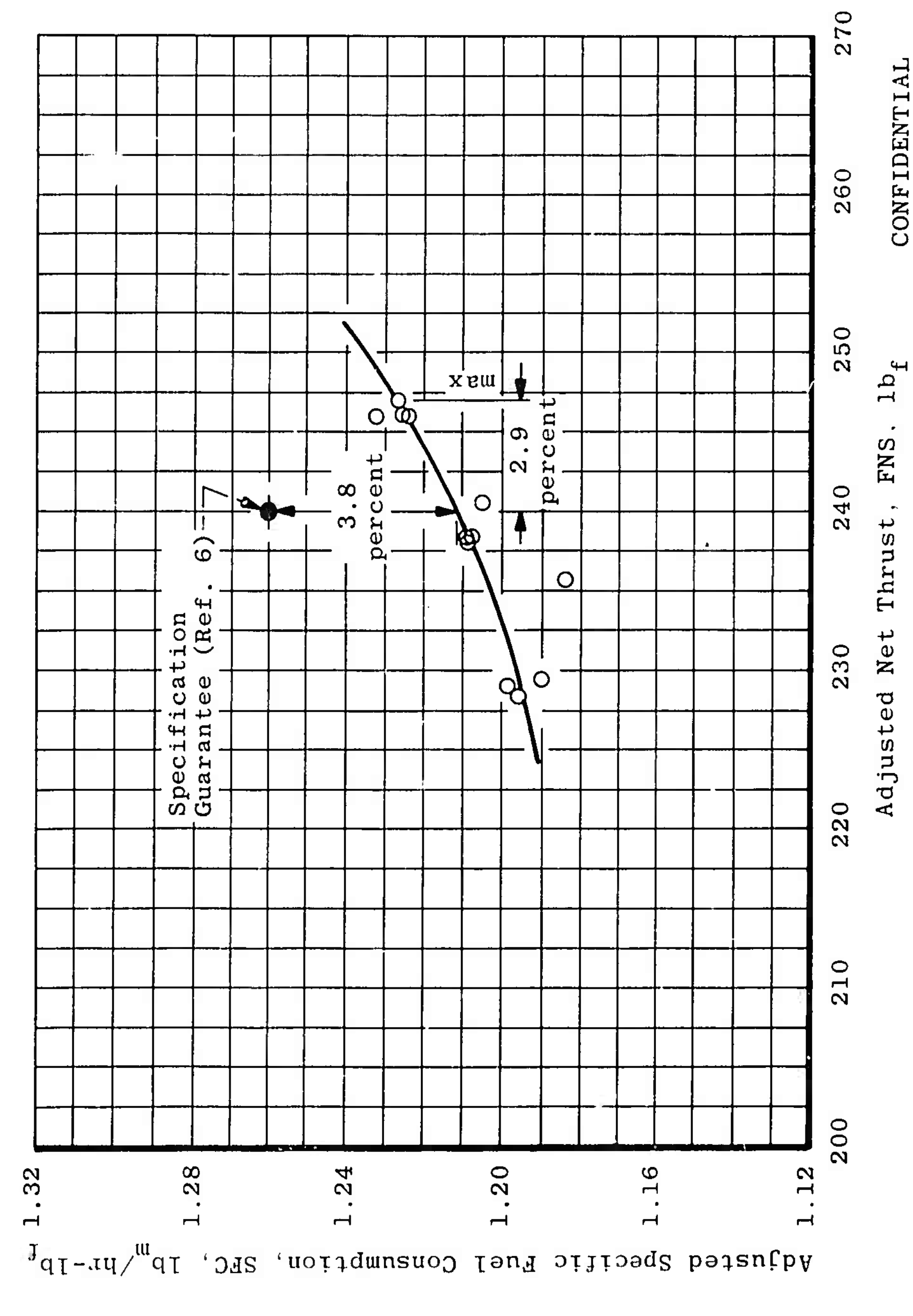


(U) Fig. 9 Comparison of Scale Force and Momentum Balance Jet Thrust



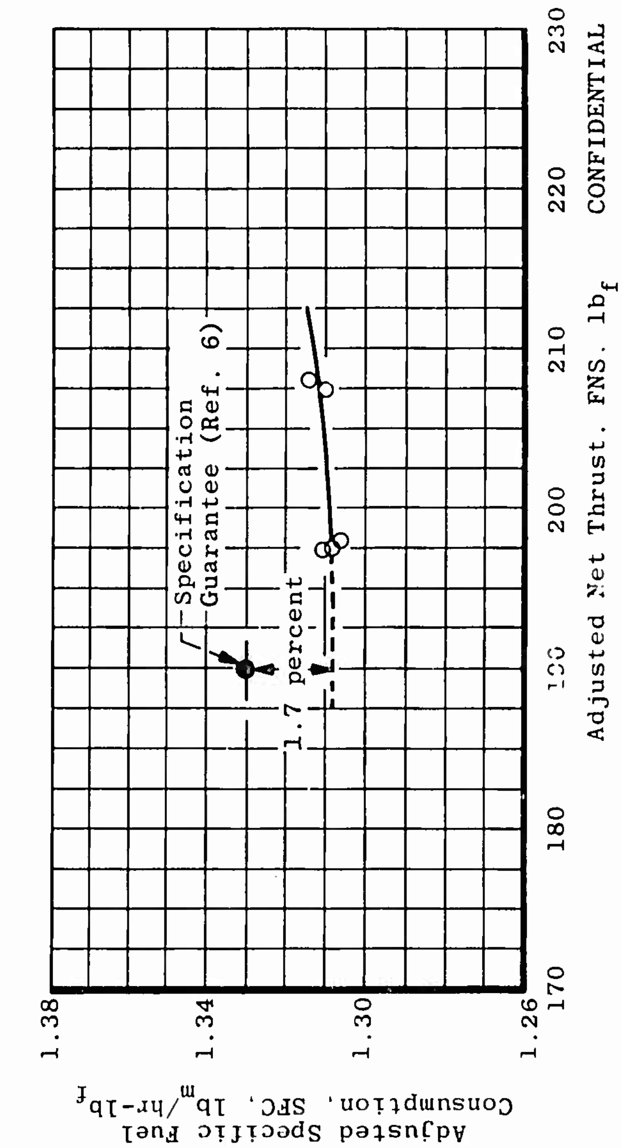
a. 36,089 ft, Mach Number 0.60

(C) Fig. 10 Adjusted Specific Fuel Consumption as a Function of Adjusted Net Thrust



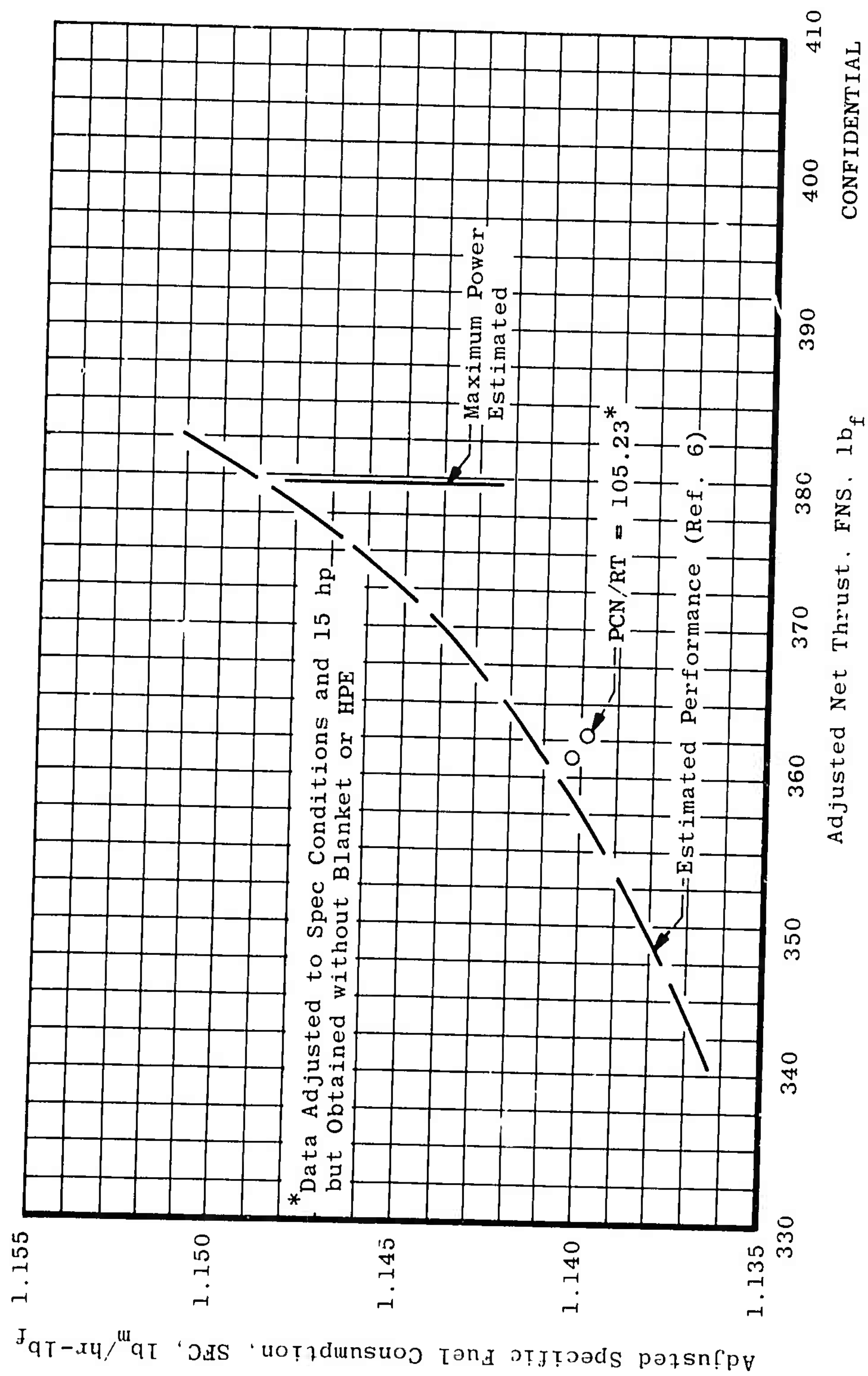
b. N ft, Mach Number 0.80

Fig. 10 Continued



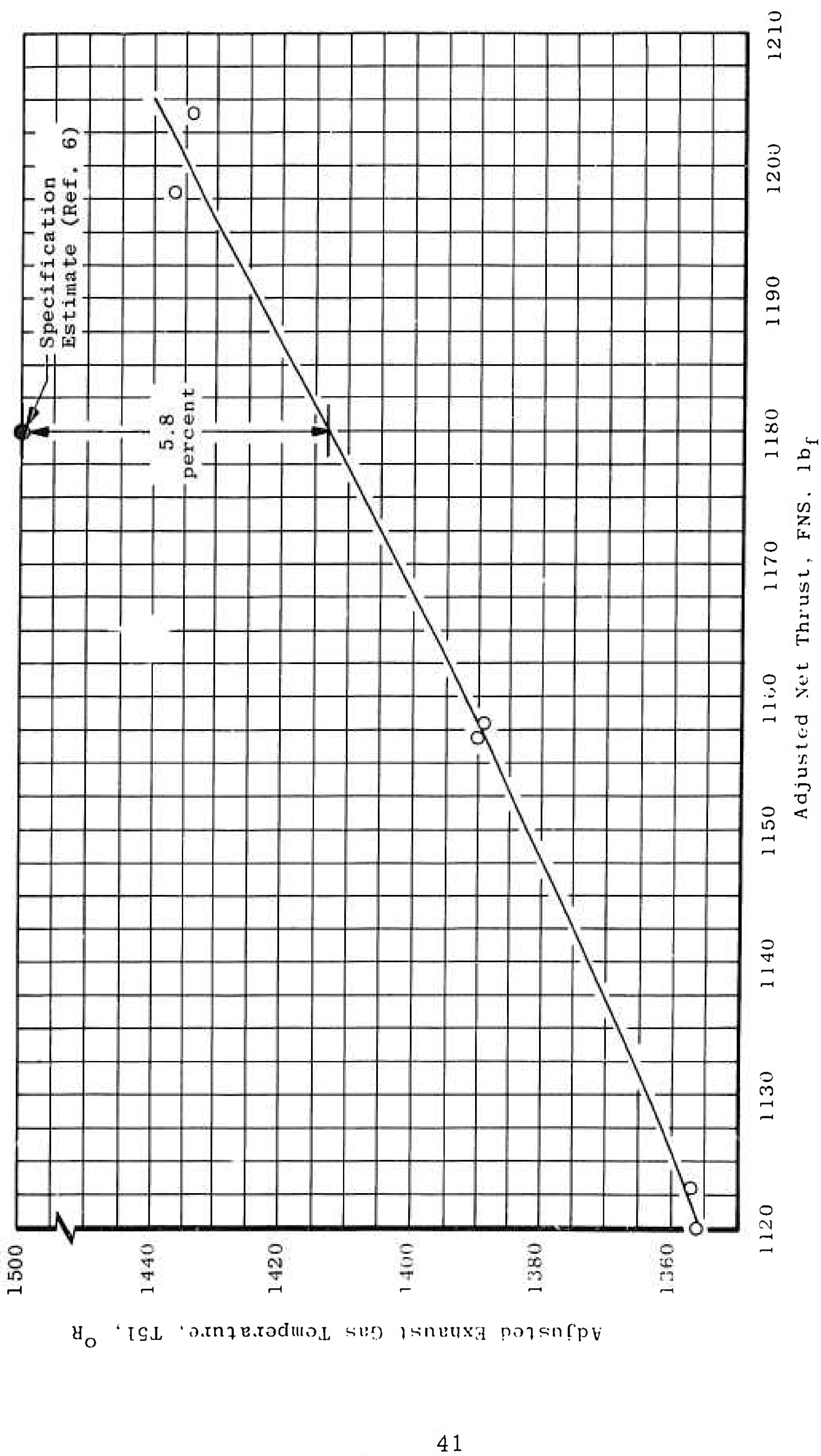
c. N + 5000 ft, Mach Number 0.85

Fig. 10 Continued



d. N – 10,000 ft, Mach Number 0.80

Fig. 10 Concluded



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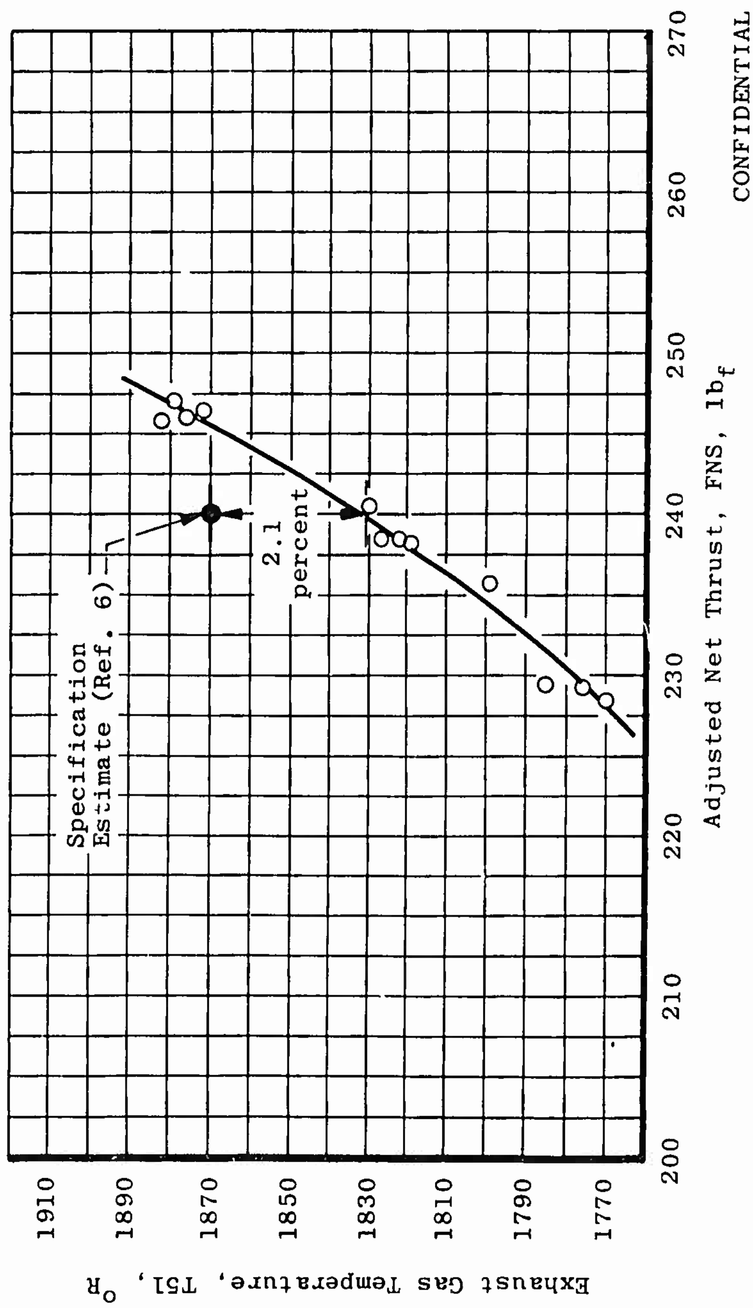
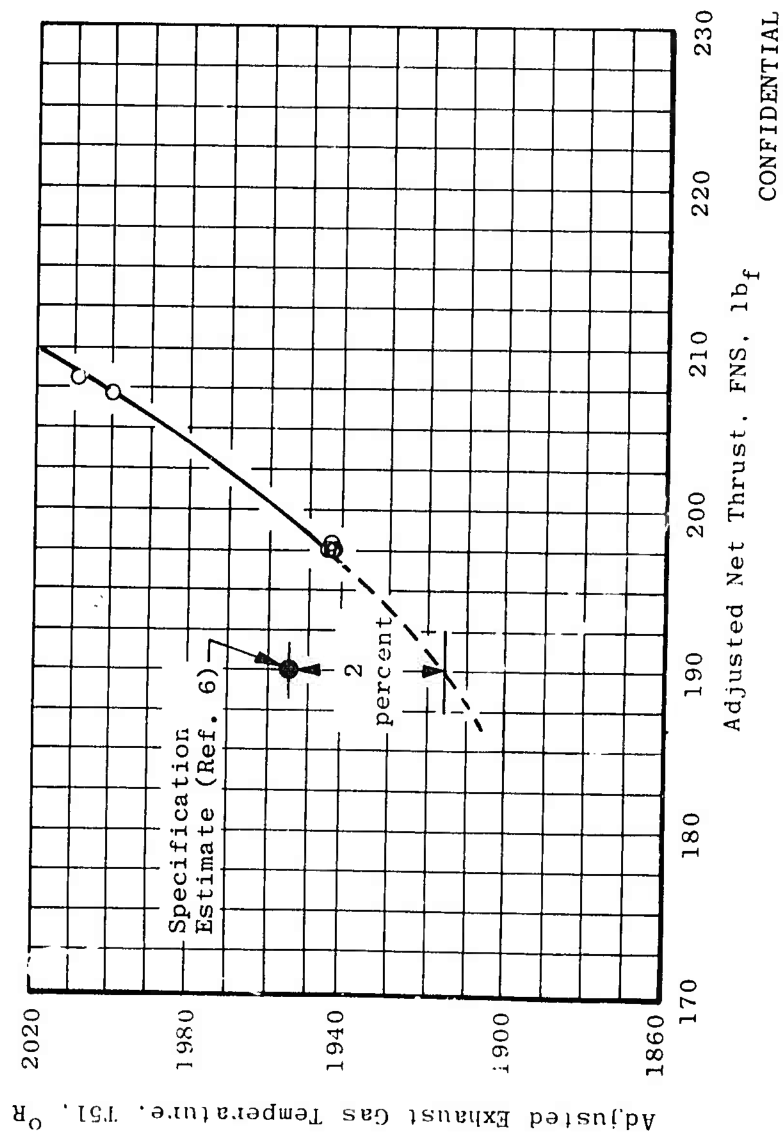
a. 36,089 ft, Mach Number 0.60

(C) Fig. 11 Adjusted Exhaust Gas Temperature versus Adjusted Net Thrust



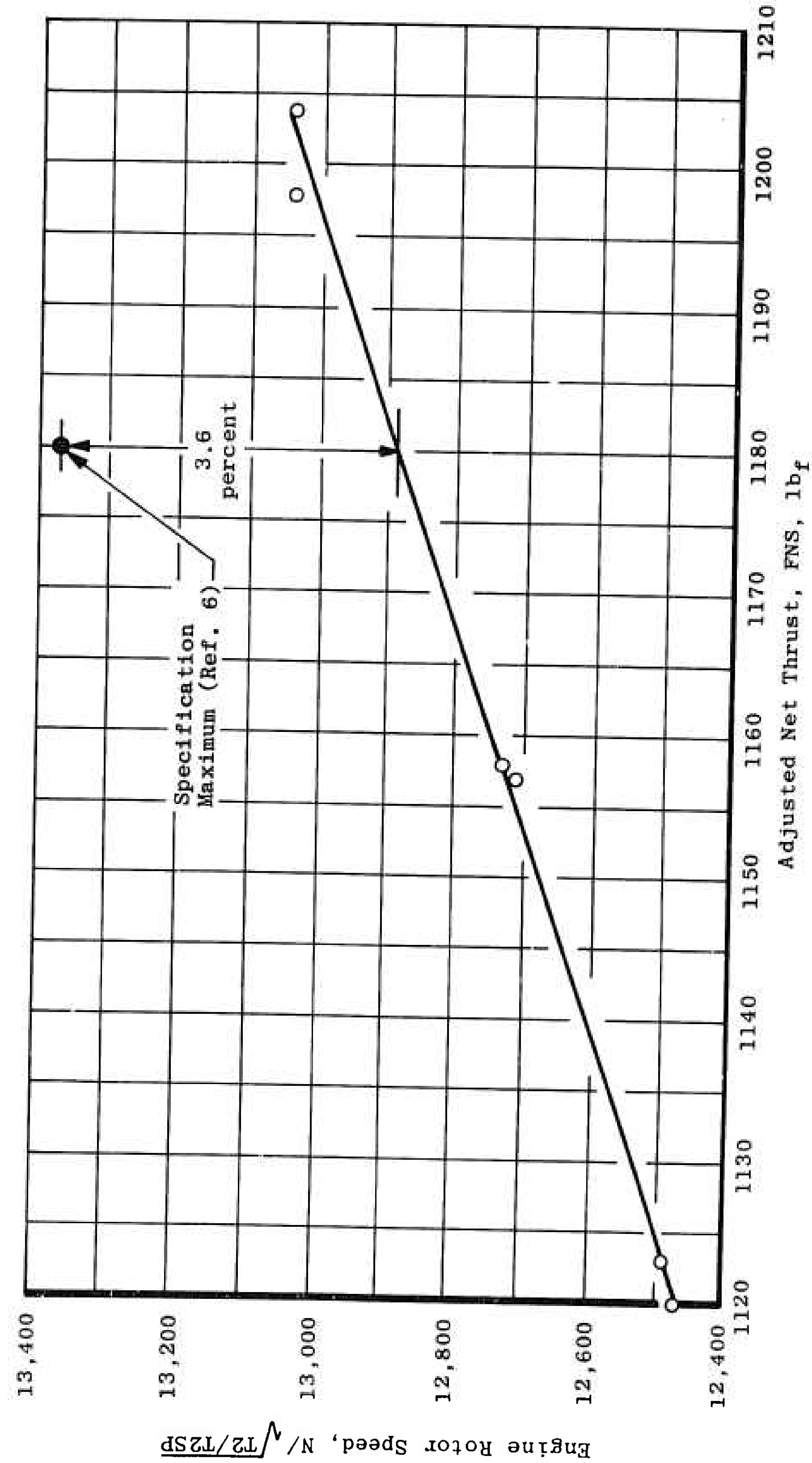
b. N ft, Mach Number 0.80

Fig. 11 Continued



c. N + 5000 ft, Mach Number 0.85

Fig. 11 Concluded



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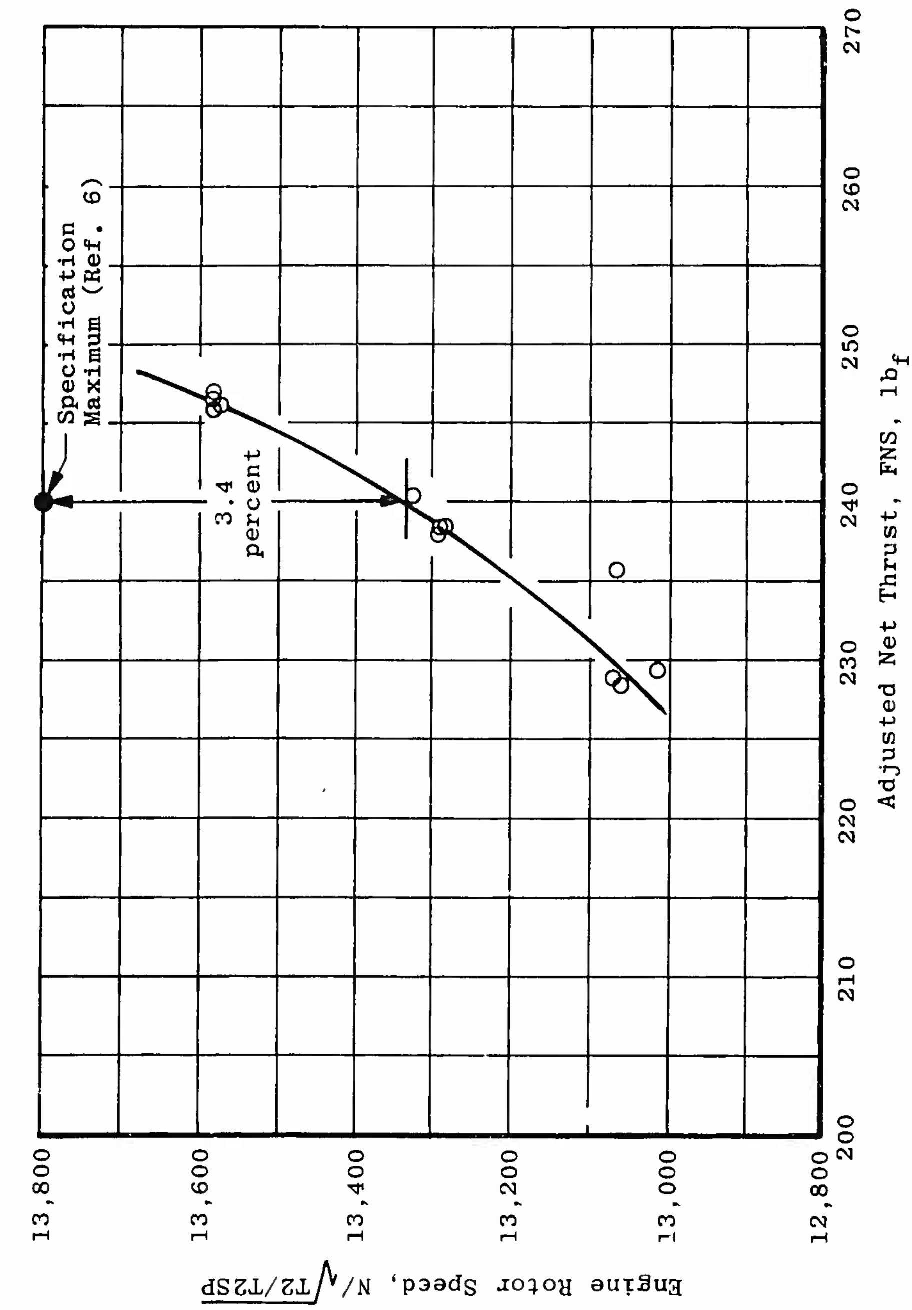
a. 36,089 ft, Mach Number 0.60

(C) Fig. 12 Engine Rotor Speed versus Adjusted Net Thrust



b. N ft, Mach Number 0.80

Fig. 12 Continued

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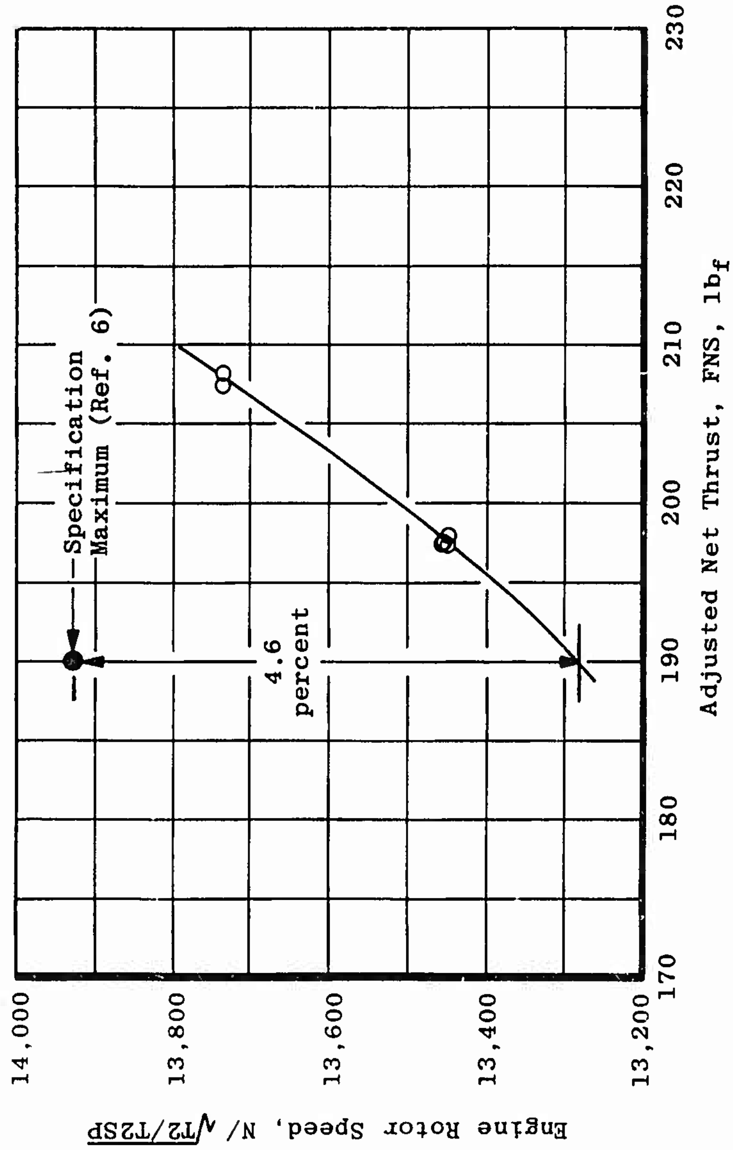

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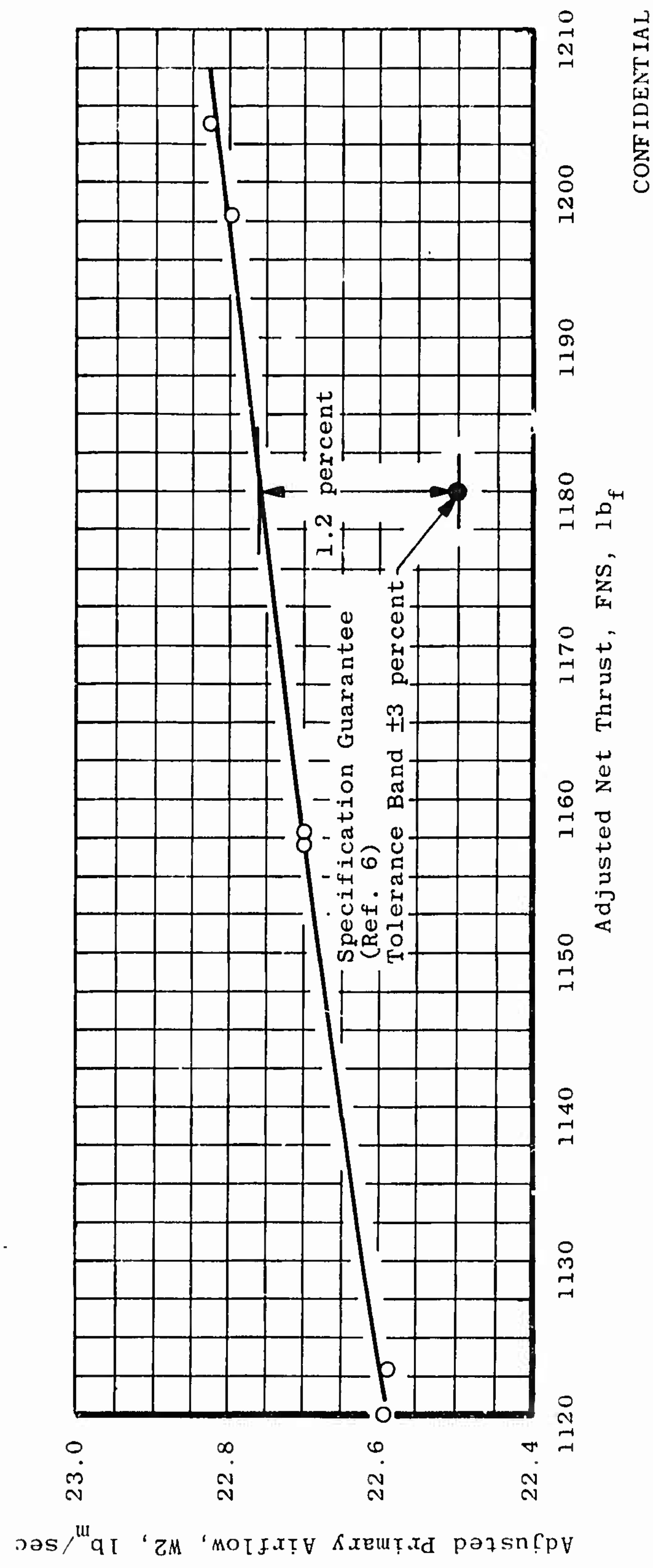
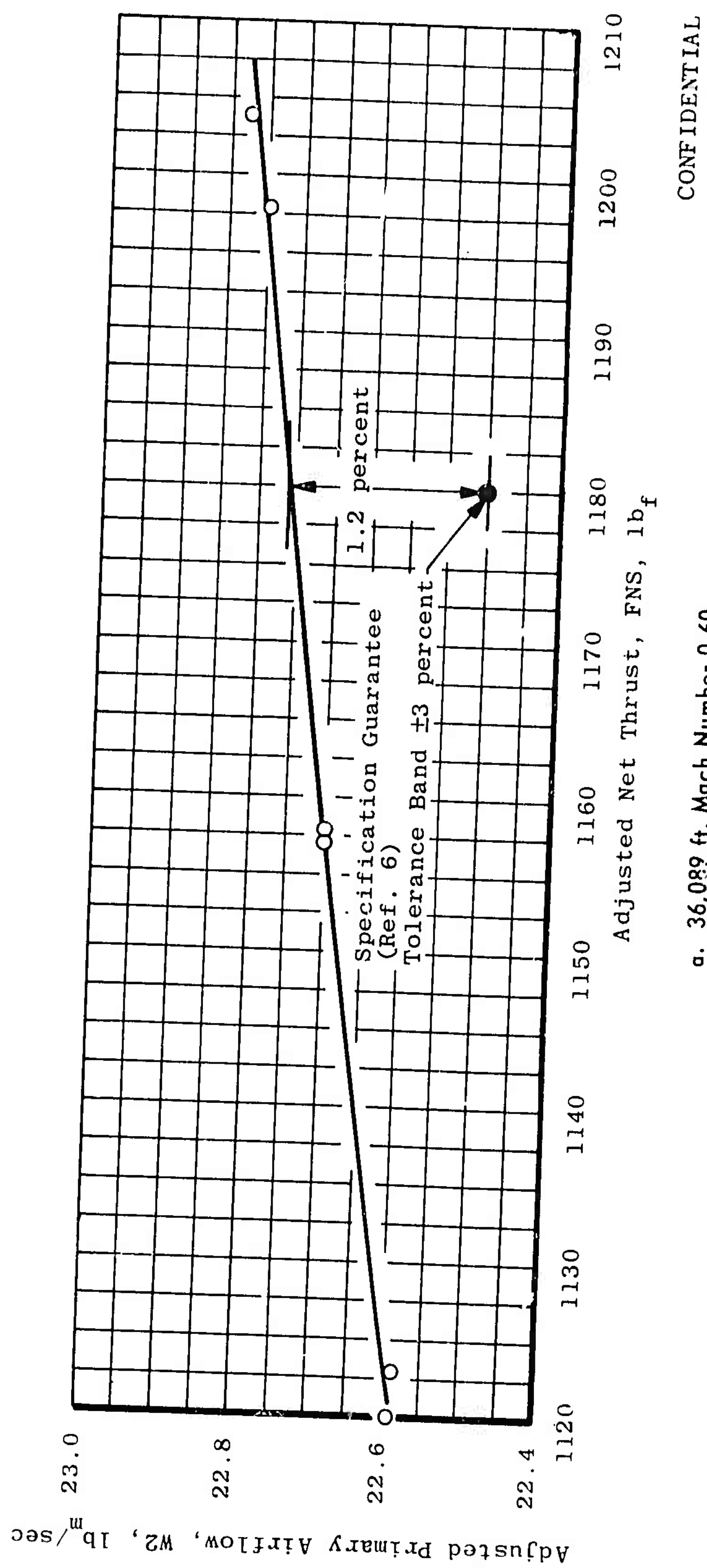
c. N + 5000 ft, Mach Number 0.85

Fig. 12 Concluded



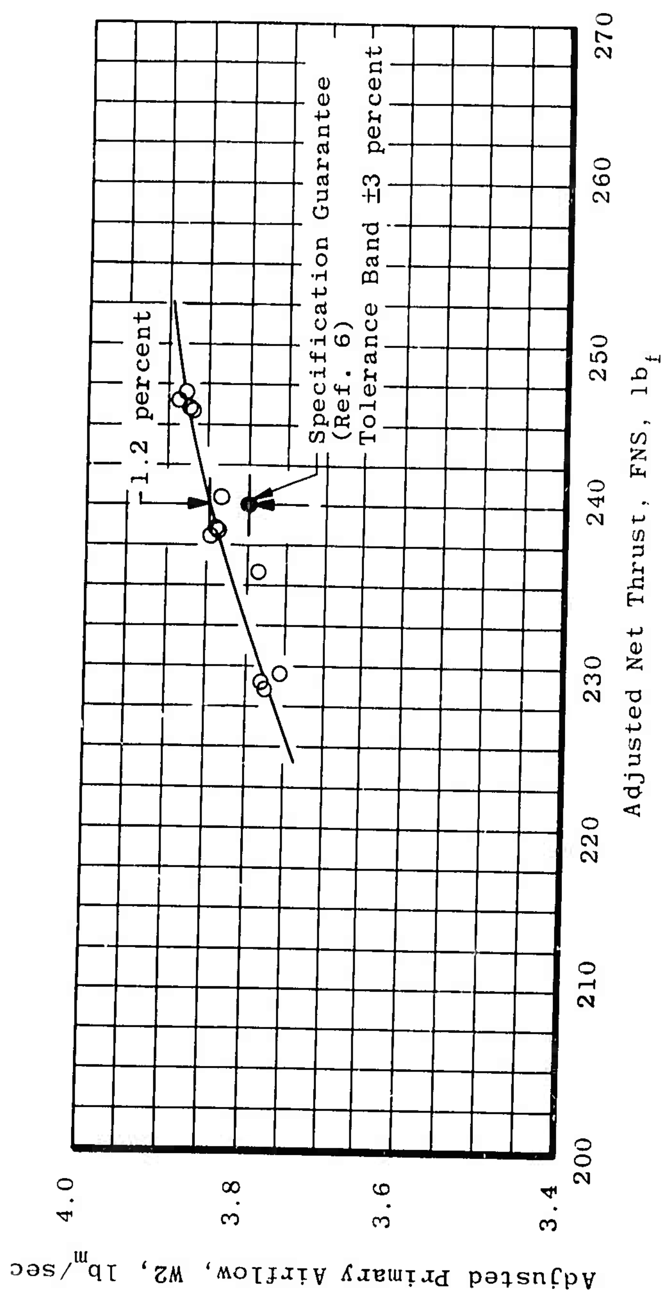
a. 36,089 ft, Mach Number 0.60

(C) Fig. 13 Adjusted Primary Airflow versus Adjusted Net Thrust



a. 36,089 ft, Mach Number 0.60

(C) Fig. 13 Adjusted Primary Airflow versus Adjusted Net Thrust



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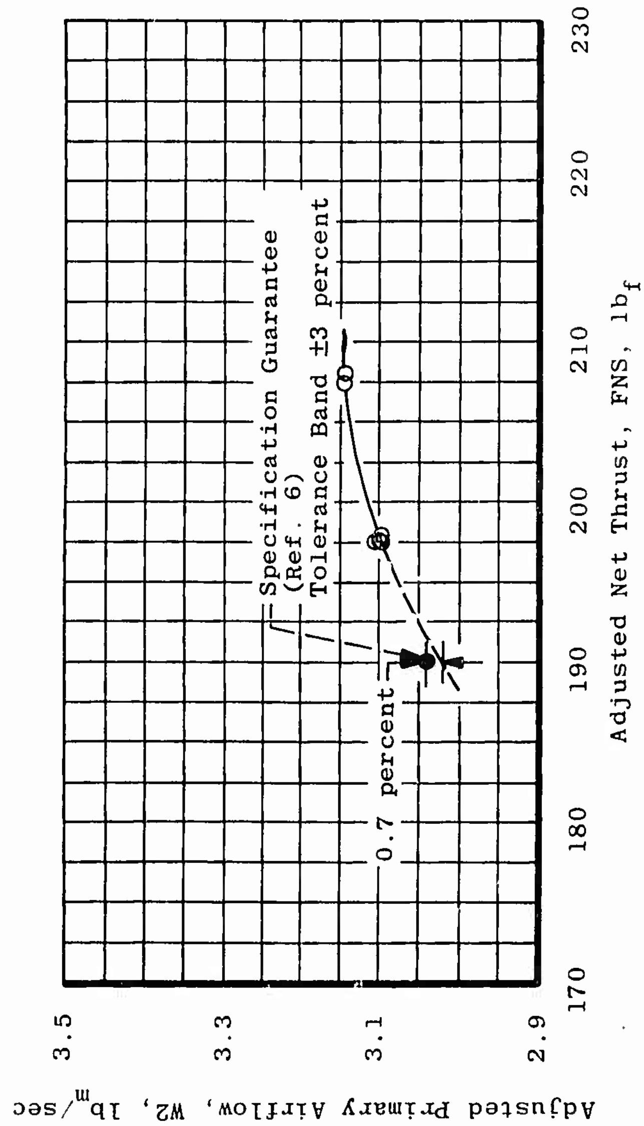
b. N ft, Mach Number 0.80

Fig. 13 Continued



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c. N + 5000 ft, Mach Number 0.85

Fig. 13 Concluded

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TABLE I
(U) STEADY-STATE MEASUREMENT UNCERTAINTY (POSTTEST)

Parameter	Estimated Measurement Uncertainty (2 Sigma)			Type of Measuring Device	Type of Recording Device	Method of System Calibration
	Steady State		Range of Measurement			
	Percent of Reading	Units of Measurement				
Venturi Inlet Plenum Static Pressure, psia	±0.50		1 to 2 psia	Bonded Strain-Gage Pressure Transducers	Automatic Multiple Pressure Scanning System onto Sequential Sampling, Millivolt-to-Digital Converter and Magnetic Tape Storage Data Acquisition System	Resistance Shunt for High Pressure Range (Run 3) In-Place Pressure Calibration for Low Pressure Range (Run 9)
	±0.50		5 to 10 psia			
Venturi Throat Static Pressure, psia	±0.60		0.5 to 1 psia			
	±0.40		3.5 to 5 psia			
Compressor Inlet Static Pressure, psia	±0.84		0.5 to 1 psia			
	±0.90		2 to 5 psia			
Compressor Inlet Total Pressure, psia	±0.72		0.5 to 1 psia			
	±0.90		3.5 to 5 psia			
Test Cell Plenum Static Pressure, psia	±0.60		0.5 to 1 psia			
	±0.40		2 to 5 psia			
Labyrinth Seal Cavity Static Pressure, psia	±0.50		0.5 to 1 psia			
	±0.40		3.5 to 5 psia			
Inlet Duct Static Pressure, psia	±0.50		0.5 to 1 psia			
	±0.40		3.5 to 5 psia			
Test Cell Static Pressure, psia	±0.60		0.5 to 1 psia			
	±0.50		2 to 3.5 psia			
Compressor Discharge Static Pressure, psia	±1.55		10 to 50 psia			
Primary Nozzle Static Pressure, psia	±1.35		0.5 to 1 psia			
	±0.75		3.5 to 5 psia			
Secondary Nozzle Inlet Total Pressure, psia	±0.60		0.5 to 1 psia			
	±0.40		3.5 to 5 psia			
Secondary Air Supply Static Pressure (Orifice), psia	±0.80		0.5 to 1 psia			
	±0.40		3.5 to 5 psia			
Secondary Air Supply Duct Static Pressure, psia	±0.80		0.5 to 1 psia			
	±0.40		3.5 to 5 psia			
Secondary Nozzle Static Pressure, psia	±1.04		0.5 to 1 psia			
	±0.75		2 to 5 psia			

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TABLE I (Continued)

Parameter	Estimated Measurement Uncertainty (2 Sigma)			Type of Measuring Device	Type of Recording Device	Method of System Calibration
	Steady State					
	Percent of Reading	Units of Measurement	Range of Measurement			
Tailpipe Static Pressure, psia	±0.40		1 to 2 psia	Bonded Strain-Gage Pressure Transducers	Automatic Multiple Pressure Scanning System onto Sequential Sampling, Millivolt-to-Digital Converter and Magnetic Tape Storage Data Acquisition System	Resistance Shunt for High Pressure Range (Run 3)
	±0.40		5 to 10 psia			
Turbine Discharge Total Pressure, psia	±0.60		1 to 2 psia			In-Place Pressure Calibration for Low Range (Run 9)
	±0.40		5 to 10 psia			
Venturi Exit Total Temperature, °F		1.6°F	-54 to 0°F	Copper-Constantan Temperature Transducers	Sequential Sampling Millivolt-to-Digital Converter and Magnetic Tape Storage Data Acquisition System	Millivolt Source and NBS Temperature Tables
Compressor Inlet Total Temperature, °F		1.2°F	-54 to 0°F			
Secondary Nozzle Stream Total Temperature, °F		±4.5°F	0 to 400°F	Chromel-Alumel Temperature Transducers		
Test Cell Temperature, °F		±4.5°F	0 to 200°F	Iron-Constantan Temperature Transducers		
Fuel Temperature, °F		±2.0°F	0 to 150°F			
Oil Cooler Discharge Liquid Temperature, °F		±4.5°F	0 to 300°F			

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TABLE I (Concluded)

Parameter	Estimated Measurement Uncertainty (2 Sigma)			Type of Measuring Device	Type of Recording Device	Method of System Calibration
	Steady State		Range of Measurement			
	Percent of Reading	Units of Measurement				
Scale Force, FS, lb_f	$[(0.66)^2 + (\frac{1.0 \times 100}{FS})^2]^{1/2}$		900 to 1100 lb_f	Bonded Strain-Gage Force Transducer	Millivolt-to-Digital Converter and Magnetic Tape Storage Data Acquisition System	Resistance Shunt (Based on In-Place System Calibration)
	$[(0.66)^2 + (\frac{1.0 \times 100}{FS})^2]^{1/2}$		150 to 300 lb_f			
Fuel Flow, pph	±0.36		1400 to 1600 pph	Turbine Volumetric Flow Transducers	Frequency-to-Voltage Converter to Millivolt to Digital Converter and Magnetic Tape Storage Data Acquisition System	Frequency Substitution (Based on In-Place System Calibration)
	±0.55		320 to 400 pph			
Engine Speed, rpm	±0.05		0 to 14,000 rpm	Electro-mechanical Transducer		
Throttle Angle, deg		±0.5°F	0 to 125 deg	Linear Potentiometer	Millivolt-to-Digital Converter and Magnetic Tape Storage Data Acquisition System	Millivolt Substitution (Based on In-Place System Calibration
Stator Angle, deg		±0.5°F	0 to 60 deg			

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TABLE II
(U) PRETEST ESTIMATES OF UNCERTAINTY FOR PERFORMANCE PARAMETERS
a. Test Conditions

Altitude, ft	36,089	N	N + 5000
Mach Number	0.6	0.8	0.85
Parameter	Percent Uncertainty		
Net Thrust (Scale Force)	±0.63	±0.88	±0.99
Specific Fuel Consumption (Scale Force)	±0.82	±1.02	±1.12
Net Thrust (Momentum Balance)	±0.94	±0.94	±0.95
Specific Fuel Consumption (Momentum Balance)	±1.09	±0.98	±0.98
Primary Engine Airflow	±0.46	±0.46	±0.46
Secondary Airflow	±1.22	±1.22	±1.22
Calculated Turbine Discharge Total Temperature	±1.23	±1.32	±1.33

1. Based on pretest estimates of two-standard deviations.
2. Uncertainties are percent of performance levels.

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TABLE II (Concluded)
b. Adjusted to Rating Conditions

Altitude, ft	36, 089	N	N + 5000
Mach Number	0. 6	0. 8	0. 85
Parameter	Percent Uncertainty		
Net Thrust (Scale Force)	±1. 52	±1. 38	±1. 73
Specific Fuel Consumption (Scale Force)	±1. 16	±1. 25	±1. 38
Net Thrust (Momentum Balance)	±1. 68	±1. 44	±1. 71
Specific Fuel Consumption (Momentum Balance)	±1. 38	±1. 23	±1. 28
Primary Engine Airflow	±0. 69	±0. 75	±0. 96
Calculated Turbine Discharge Total Temperature	±1. 23	±1. 34	±1. 34

1. Based on pretest estimates of two-standard deviations.
2. Uncertainties are percent of performance levels.

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TABLE III

(C) MEASURED PERFORMANCE VALUES FROM J97 QUALIFICATION TEST AT AEDC ADJUSTED TO SPECIFICATION CONDITIONS

Run and Point No.	Altitude, ft	Mach No.	Engine Speed, rpm	Engine Airflow, lb_m/sec	Calculated Exhaust Gas Temperature, °R	Scale Force Net Thrust, lb_f	Scale Force Specific Fuel Consumption, $lb_m/hr\text{-}lb_f$	Momentum Balance Net Thrust, lb_f	Momentum Balance Specific Fuel Consumption, $lb_m/hr\text{-}lb_f$
3-6	36, 089	0.6	12, 493	22.59	1357	1123	0.940	1122	0.940
3-7	↓	↓	12, 476	22.59	1356	1120	0.941	1122	0.940
3-8	↓	↓	12, 713	22.70	1390	1157	0.951	1158	0.951
3-9	↓	↓	12, 731	22.70	1389	1158	0.949	1158	0.950
3-10	↓	↓	13, 047	22.83	1434	1204	0.966	1207	0.962
3-11	↓	↓	13, 043	22.80	1437	1198	0.971	1204	0.966
9-2	N	0.8	13, 068	3.79	1799	235.8	1.184	237.0	1.178
9-3	↓	↓	13, 014	3.76	1785	229.4	1.190	230.0	1.187
9-15	↓	↓	13, 327	3.83	1830	240.6	1.205	241.8	1.199
9-16	↓	↓	13, 287	3.84	1827	238.6	1.209	241.2	1.196
9-17	↓	↓	13, 291	3.84	1822	238.5	1.208	241.7	1.192
9-18	↓	↓	13, 294	3.84	1819	238.2	1.208	241.5	1.192
9-20	↓	↓	13, 574	3.87	1876	246.2	1.226	250.2	1.206
9-21	↓	↓	13, 582	3.87	1882	245.9	1.233	251.6	1.204
9-22	↓	↓	13, 585	3.89	1872	246.5	1.224	250.6	1.204
9-23	↓	↓	13, 587	3.88	1879	247.1	1.227	251.0	1.208
9-25	↓	↓	13, 061	3.78	1770	228.4	1.196	229.6	1.190
9-26	↓	↓	13, 071	3.78	1776	229.2	1.199	231.2	1.188
9-31	N+5000	0.85	13, 450	3.10	1945	197.5	1.309	203.1	1.273
9-32	↓	↓	13, 450	3.10	1945	197.9	1.306	203.1	1.273
9-33	↓	↓	13, 453	3.10	1944	197.6	1.308	203.0	1.273
9-34	↓	↓	13, 451	3.10	1946	197.5	1.310	203.4	1.272
9-35	↓	↓	13, 735	3.14	2009	208.2	1.314	212.2	1.290
9-38	↓	↓	13, 735	3.15	2000	207.4	1.310	210.6	1.290

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TABLE IV

(U) SUMMARY OF OPERATION OF YJ97-GE-3 ENGINE S/N E447007 AT AEDC

	Total Time
Operating Time at Altitudes less than N ft	13 hr, 44 min
Operating Time at N ft Altitude	12 hr, 24 min
Operating Time at N + 5000-ft Altitude	2 hr, 26 min
Total Operating Time at AEDC	28 hr, 34 min

After 28-hr, 34-min total engine operating time at AEDC, testing was halted by a rim failure of the second-stage turbine wheel. Four turbine blades were lost and exited through the side of the engine tailpipe.

Vibration levels observed during testing of engine S/N E447007 at AEDC were well below the maximum specified limits. Maximum observed values were as follows:

	Maximum Specified Limit, mils	Maximum Observed Level, mils
Compressor Front Frame	4	1.7
Compressor Rear Frame	6	2.6

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TABLE V
(U) ALTITUDE START SUMMARY

The conditions listed below are conditions for all start attempts for J97 engines S/N's E447051 and E447007. Successful starts were made on each start attempt.

Engine S/N	Altitude, ft, Based on Cell Pressure	Mach No. Based on P_{T2}/P_{cell}	Range of Compressor Inlet Total Temperature, °F	Windmill, rpm	No. of Starts
051	6500	0.6	+50	3400	2
(Ref. 5)	23,000	0.6	-20 to +24	3430 to 3680	5
	27,000	0.7	+10 to +30	3870 to 3930	3
	30,000	0.8	-15	3880	1
007	29,000	0.6	0 to +70	3130 to 3425	10
	30,000	0.8	60	3480	1
	35,000	0.7	50	3900	1

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TABLE VI
(U) ENGINE FLAMEOUT DATA

No flameouts occurred during operation of engine S/N E447007 at AEDC. Compressor discharge pressure was maintained at a level of 10 psia or greater during all altitude transients.

Three flameouts occurred during operation of engine S/N E447051 (Ref. 5) at AEDC. No erratic engine operation occurred prior to the flameouts, and engine vibration levels were only slightly above steady-state operating levels.

All flameouts occurred during transition between altitude set points.

Conditions were as follows:

Corrected Speed, percent	Flameout during Transition*	
	From Altitude, ft	To Altitude, ft
96	23, 000	N - 15, 000
96	28, 000	N - 5000
102	N - 5000	N

*Rate of change less than 1 psia/min.

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TABLE VII
(U) J97 TURBOJET ENGINE MODEL SPECIFICATION, TABLE II*

Data / Rating			
Pressure Altitude, ft	36,089	N	N + 5000
Mach No.	0.6	0.8	0.85
Ram Recovery	0.99	0.99	0.99
Percent Bleed Air	0	0	0
HP Extraction	15	15	15
Net Jet Thrust (Min), lb_f	1180 / 1180	240 / 240	190 / 190
Specific Fuel Consumption (Max), lb/hr/lb	0.96 / 0.98	1.21 / 1.26	1.31 / 1.33
Exhaust Gas Temperature (Estimated), °R	1413 / 1500	1831 / 1870	1916 / 1955
Engine Rotor RPM (Max)	12,885 / 13,377	13,340 / 13,800	13,280 / 13,923
Primary Airflow (±3 percent), lb/sec	22.8 / 22.5	3.85 / 3.80	3.02 / 3.04
Primary Nozzle Position	139 in.^{2} / Normal	139 in.^{2} / Normal	139 in.^{2} / Open

*Performance Data from Qualification Testing at AEDC
Performance Ratings at Standard Altitude Conditions

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APPENDIX III
METHODS OF CALCULATION

(U) The general methods and equations used to compute the parameters presented in this report are given below. Where applicable, the arithmetic average of pressure and indicated temperatures was used.

SPECIFIC HEAT

(U) The specific heat at constant pressure was calculated from the empirical equation,

$$cp = \frac{(a_1 + b_1 T + c_1 T^2) + F(a_2 + b_2 T + c_2 T^2)}{1 + F}$$

where a_1, b_1, and c_1 are constants based on the specific heats of the constituents of air, and a_2, b_2, and c_2 are constants based on fuel hydrogen-carbon ratio of 0.16 and the specific heats of water vapor, oxygen, and carbon dioxide.

Temperature Range, °R	a_1	b_1	c_1	a_2	b_2	c_2
400 to 1700	0.2318	0.104×10^{-4}	0.7166×10^{-8}	0.2655	3.7265×10^{-4}	-6.6353×10^{-8}
1701 to 4500	0.2214	0.3521×10^{-4}	-0.3776×10^{-8}	0.3397	2.7182×10^{-4}	-2.9044×10^{-8}

(U) The ratio of specific heats was determined from

$$\gamma = \frac{c_p}{c_v} \quad \text{where } c_v = c_p - \frac{R}{J}$$

AIR AND GAS FLOW

Air

(U) Airflow at station 1N (venturi throat) was calculated from the equation,

$$WAIN = \frac{P00\,(CFIN)\,AIN\,(CTIN)\sqrt{\frac{\gamma g_c}{R}\left(\frac{2}{\gamma + 1}\right)^{\frac{\gamma+1}{\gamma-1}}}}{\sqrt{TT1D}}$$

where $\gamma = \gamma_2$; CT1N, the area thermal expansion coefficient, was calculated from the venturi wall temperature; and CF1N, an empirically determined flow coefficient based on venturi curvature and boundary-layer development (Ref. 10), was calculated from the expression for a choked venturi.

(U) For small venturi,

$$CF1NA = 0.97918 + 2.2010 \times 10^{-3} \log (RN1A)$$

where

$$RN1A = \text{Small venturi throat Reynolds number}$$

(U) For large venturi,

$$CF1NB = 0.97773 + 2.6467 \times 10^{-3} \log (RN1B)$$

where

$$RN1B = \text{Large venturi throat Reynolds number}$$

$$W_2 = WA1NA + WA1NB$$

Turbine Cooling Air

(U) Compressor discharge bleed air (WC) for turbine cooling purposes was determined from the equation,

$$WC = WC3 + WC4 = 0.0700\ W2 + 0.0494W2$$

where for calculation purposes, WC3 was assumed to reenter the primary gas stream at the turbine inlet and WC4 at the turbine exit. The above fractions of the total airflow were supplied by the engine manufacturer.

(U) Airflow at Station 31 was determined from the equation,

$$W31 = W2 - WC3 - WC4$$

$$= 0.8806\ W2$$

Secondary Airflow

(U) The secondary airflow (W17) was calculated as follows:

$$W17 = WSM - WLEAK$$

$$WSM = \text{Secondary orifice flow}$$

$$= C_1 K \left[1 - C_2 \frac{(PSOR1 - PSOR2)}{PSOR1}\right] \sqrt{\frac{PSOR1\ (PSOR1 - PSOR2)}{TOR}}$$

where C_1, C_2, and K are empirical constants derived from the ASME power test code for sharp-edged orifices with flange pressure taps and where

PSOR1 = Orifice upstream pressure
PSOR2 = Orifice downstream pressure
TOR = Downstream orifice gas temperature

WLEAK = Secondary plenum chamber leakage flow

Gas Flow

(U) Gas flow at Station 39 was determined from

$$W39 = W31 + WF/3600$$

(U) Gas flow at Stations 40 and 50 was obtained from

$$W40 = W50 = W2 - WC3 + WF/3600$$

(U) Gas flow at Stations 51 and 8 was calculated from the equation,

$$W51 = W8 = W2 + WF/3600$$

HEAT RATE

(U) The heat rate of the lube oil to water heat exchanger was calculated as follows:

$$QSW = WCW\,(CPWOC)\,(TWSCD - TWSCI)$$

where

WCW = Cooling water flow rate
CPWOC = Average c_p of cooling water = 1.020
TWSCD = Cooling water discharge temperature
TWSC1 = Cooling water inlet temperature

Note: This equation was in the program, but because the heat exchanger was not turned on, QSW was set equal to 0.0 for all of the test points.

HORSEPOWER

(U) The shaft horsepower extracted (HPE) by the hydraulic pump mounted on the gearbox was calculated by the following equation:

$$HPE = WHF\left[\frac{PTMO - PTMI}{8.57 \times 10^5 \times SGHF} + (TTMO - TTMI)\,CPHF \times 3.93 \times 10^{-4}\right]$$

where

WHF = Hydraulic fluid mass flow

PTMO = Hydraulic pump outlet pressure

PTMI = Hydraulic pump inlet pressure

TTMO = Hydraulic pump outlet temperature

TTMI = Hydraulic pump inlet temperature

CPHF = Specific heat of hydraulic fluid

$$= 0.4456 + 0.00056\left(\frac{TTMO + TTMI}{2} - 60\right)$$

SGHF = Specific gravity of hydraulic fluid

$$= 0.8686 + 0.00036\,(60 - TTMO)$$

ENTHALPY

(U) The enthalpy of air was obtained by integrating the equation

$$H = \int_{400^\circ R}^{T} c_p dt$$

(U) The enthalpy of turbine inlet, turbine discharge, and exhaust gases was calculated as follows:

$$H51 = \frac{H2W2 + ETABM \times h_L + 59.62\,\frac{WF}{3600} - \frac{QSW}{3600} - \frac{HPE}{1.415}}{W51}$$

where the burner efficiency (ETABM) is calculated from an empirical equation furnished by the engine manufacturer as follows:

$$ETABM = \eta_{Base}\left(\frac{P3}{15}\right)^{0.084}\left(\frac{T3}{1160}\right)^{0.25} \quad \text{(limited to 0.985)}$$

where

η_{Base} = Base burner efficiency

$$\eta_{Base} = 0.7924 + 0.4492 \times 10^{-4}\,(T39 - T3) + 0.4152 \times 10^{-6}\,(T39 - T3)^2 - 0.3722 \times 10^{-9}\,(T39 - T3)^3 + 0.8850 \times 10^{-13}\,(T39 - T3)^4$$

and where the quantity -59.62 Btu/lb_m of fuel is the difference between the enthalpy of exhaust gas at 540°R and air at 400°R/lb of fuel burned. The term QSW is the equivalent heat removed by the lube oil auxiliary cooler and is determined from lube system heat rejection data.

$$H50 = \frac{W51\ (H51) - (WC3)\ H3}{W50}$$

$$H40 = H50 + \frac{W2\ (H3 - H2)}{W4}$$

where turbine energy extraction is assumed equal to the energy added by the compressor.

$$H39 = \frac{W40\ H40\ -\ WC4\ H3}{W39}$$

TEMPERATURE

Measured

(U) Total temperature for Station 1D was obtained by dividing the indicated temperature by a correction factor of 0.9977 per NACA TN 3766 (Ref. 11).

(U) Total temperature for Stations 2 and 3 was obtained by applying a recovery factor to the indicated temperature through the equation,

$$T = \frac{T_i}{\left(\frac{PS}{P}\right)^{\frac{\gamma - 1}{\gamma}} + RF\left[1 - \left(\frac{PS}{P}\right)^{\frac{\gamma - 1}{\gamma}}\right]}$$

where

$$RF = 0.9327 \text{ (Station 2)}$$

$$RF = 0.9704 \text{ (Station 3)}$$

(C) The Station 2 temperature was also corrected for pressure per NACA TN 3766 (Ref. 11). The pressure correction for a similar, self-aspirating thermocouple (Config. 6, Ref. 11) was obtained from Fig. 7 of Ref. 11. The curve had to be extrapolated from 0.17 atm down to approximately 0.05 atm to obtain corrections for the full range of test conditions. At 0.05 atm, the extrapolated value of the recovery factor was 3.4 times the value at 1 atm. No adjustments were made for any differences in probe geometry between the actual probe and Config. 6 in Ref. 11.

Calculated

(U) The calculated total temperature at Stations 39, 40, 50, and 51 was obtained from the iteration of the equation,

$$\int_{400^\circ R}^{T} c_p dt = H$$

where H is the calculated enthalpy.

(U) The total temperature at the compressor discharge (T3) was not measured but was obtained from the compressor inlet total temperature and pressure, the compressor discharge total pressure, and the predicted compressor efficiency obtained from the test of engine S/N E447051 (Ref. 5) as follows:

$$PR2 = 2.7183^{[3.3822 \ell n T2 + 1.5175 \times 10^{-4} T2 + 5.2294 \times 10^{-8} T2^2 - 20.332]}$$

(equation of air tables)

$$PR3I = PR2 \left(\frac{P3}{P2}\right)$$

T3I determined by iterating equation for PR2 substituting T3 in place of T2

$$H3I = \int_{400}^{T3I} c_p dT \qquad H2 = \int_{400}^{T2} c_p dT$$

$$H3 = \left(\frac{H3I - H2}{ETAC}\right) + H2$$

ETAC determined from Fig. III-1

T3 determined by iterating $H3 = \int_{400}^{T3} c_p dt$

(U) The total temperature at the primary exhaust nozzle exit (T8) was determined from the calculated turbine exit temperature (T51) and a theoretical calculation of the thermal losses in the tailpipe between stations 51 and 8 as follows:

$$T8 = \frac{T8}{T51} \times T51$$

where T8/T51 was obtained from Fig. III-2 for runs conducted without the tailpipe thermal insulation blanket and from Fig. III-3 for runs conducted with the tailpipe thermal insulation blanket.

ENGINE HEAT LOSS THROUGH EXTERNAL SKIN

(U) To calculate the external heat losses of the engine through the external skin, the following assumptions were made:

(U) 1. Convective heat losses are neglected through secondary air.

(U) 2. The model for net radiation heat transfer between the engine and cell wall was assumed to be a series of concentric cylinders.

(U) 3. Estimates were made of all skin temperatures where skin thermocouple measurements were not available.

(U) Net radiation heat transfer from the engine was calculated as follows:

$$Q_{rad} = \frac{A_{eng} \times \sigma \times (T_{eng}^4 - T_{cell}^4)}{\frac{1}{\epsilon_{eng}} + \frac{A_{eng}}{A_{cell}}\left(\frac{1}{\epsilon_{cell}} - 1\right)}, \text{ Btu/hr}$$

where

σ = Boltzmann radiation constant = 0.1714×10^{-8} Btu/hr – ft^2 – °R

(U) Heat loss to the secondary stream (upstream of primary nozzle exit) was calculated as follows:

$$Q_{sec} = WSM \times c_p(TTS - TOR), \text{ Btu/hr}$$

(U) Total engine heat loss was calculated as follows:

$$Q_t = Q_{rad} + Q_{sec}$$

(U) For simplification purposes and because the major portion of the heat losses occurs in the tailpipe and primary nozzle, it was assumed that <u>all</u> of the heat losses occurred between the turbine exit (T51) and the primary nozzle exit (T8). Based on these assumptions, the effect of the heat losses on the gas temperature at station 8 was calculated by

$$T8 = T51 - \frac{Q_t}{c_p W8}$$

Curves of T8/T51 are enclosed for the engine with and without the tailpipe thermal blanket (Figs. III-2 and III-3). The assumptions made in the calculation of the two T8/T51 curves are spelled out on the curves. The assumptions were refined, and more skin temperature data were obtained between the development of the curve without the tailpipe thermal insulation blanket (Fig. III-2) and the curve with the blanket (Fig. III-3), which accounts for the changes in the emissivity values in Fig. III-3.

PRESSURE (CALCULATED)

Compressor Discharge Total Pressure

(C) The total pressure (P3) at the compressor discharge (station 3) was determined from the measured compressor discharge static pressure and the relationship of PS3 and P3, determined during the test of J97 engine S/N E447051 (Ref. 5), according to the following relationship:

$$PS3/P3 = 1.01173 - 14.119\,(RNI2) + 9.5891\,(RNI2)^2 - 27.742\,(RNI2)^3 + 34.670\,(RNI2)^4 - 15.181\,(RNI2)^5$$

Primary Exhaust Nozzle Total Pressure

(C) The exhaust nozzle inlet total pressure (P7) was not measured but was determined from P52 and empirical information provided by the engine manufacturer (obtained from the test of J97 engine S/N 424005/2, Ref. 4) according to the following relationship:

$$P7 = P8 = P52 \times 0.9603 + 0.0018 \times \log_{10} RN8$$

Exhaust Nozzle Discharge Coefficient

(U) A primary exhaust nozzle discharge coefficient was calculated using the following equation,

$$CF8 = \frac{AE8}{A8H}$$

where

$$AE8 = \frac{W8\sqrt{(T8)}\sqrt{\dfrac{R}{\gamma g_c}\left(\dfrac{2}{\gamma + 1}\right)}}{PS8}, \text{ for a choked nozzle}$$

and

$$PS8 = P7\left(\frac{2}{\gamma + 1}\right)^{\frac{\gamma}{\gamma - 1}}$$

where

$$\gamma = \gamma 51$$

REYNOLDS NUMBER INDEX

(U) Reynolds number index was defined as

$$RNI2 = \frac{\delta 2(T2 + 199.5)}{718.2(\theta 2)^2}$$

THRUST

Jet Thrust

(U) Jet thrust along the exit nozzle axial centerline was calculated from the following expression,

$$FJS = \frac{FS + \frac{W2}{g_c} V1 + A1OD(PS1 - P_0) + \frac{WSM}{g_c} V_{ss} + ASSOD\ (PSSS - P_0)}{\cos 7\ \text{deg}}$$

where

FS = Load cell force, lb_f

$A1OD$ = Outside area of primary duct at labyrinth seal

$ASSOD$ = Outside area of secondary duct at labyrinth seal

(U) A free body diagram of the force terms of the jet thrust equation is presented in Fig. 1 -4.

Isentropic Jet Thrust

(U) The isentropic jet thrust was calculated from the equation,

$$FJISEN = W8\ (KV9) \sqrt{\frac{R(T8)}{g_c}}$$

where KV9, the velocity parameter for a perfectly expanded nozzle, was calculated as follows:

$$KV9 = \sqrt{\frac{2\gamma}{\gamma - 1} \left[1 - \left(\frac{P_0}{P8} \right)^{\frac{\gamma - 1}{\gamma}} \right]}$$

where

$$\gamma = \gamma 51$$

Momentum Balance Jet Thrust

(C) The momentum balance jet thrust (FJMB) was calculated by the following equation (Fig. III-5 shows a free body diagram of the forces acting on the primary and secondary exhaust nozzles):

$$FJMB = \frac{W8}{g_c} V8 + PS8(A8H) + SUMPAP + MSVS + PSASH$$

$$- \frac{W8}{g_c} VB - PB(ACH) + SUMPAD + \sum\left(\frac{WSL}{g_c}\right) VSL$$

$$+ \sum PSL\,(ASL) - P_0(A9H) - \Delta FJMMB$$

where

$$V8 = M8\ (CV8) \sqrt{\gamma g_c R(T8) \left(\frac{PS8}{P8}\right)^{\frac{\gamma-1}{\gamma}}}$$

where

$$M8 = 1.0$$

where CV8 is a velocity coefficient derived from an engine manufacturer-supplied equation as follows:

$$CV8 = 0.9776 + 0.4550 \times 10^{-1} \left(\frac{P7}{PLS}\right) - 0.3045 \times 10^{-1} \left(\frac{P7}{PLS}\right)^2$$

$$+ 0.7529 \times 10^{-2} \left(\frac{P7}{PLS}\right)^3 - 0.7997 \times 10^{-3} \left(\frac{P7}{PLS}\right)^4$$

$$+ 0.3047 \times 10^{-4} \left(\frac{P7}{PLS}\right)^5$$

where

PLS	=	Primary nozzle external lip static pressure
γ	=	$\gamma 51$
T8	=	Calculated primary exhaust nozzle total temperature
SUMPAP	=	Sum of the axial components of the pressure area forces acting on the exterior of the primary nozzle
MSVS	=	Momentum of secondary air at plane "S" in Fig. III-5
PSASH	=	Pressure area force acting in plane "S"
$\frac{WB}{g_c} VB$	=	Momentum of air passing plane "B" in Fig. III-5
PBACH	=	Pressure area force acting in plane "B"
SUMPAD	=	Sum of the axial components of the pressure area forces on the secondary nozzle
$\sum\left(\frac{WSL}{g_c}\right) VSL$	=	Sum of the momentum of the air passing through the slots in the secondary nozzle

$\sum PSL(ASL)$ = Sum of the products of the slot static pressures and the slot flow areas

$\Delta FJMMB = (\Delta CFG + \Delta CFGSW)(FJISEN)$

(ΔCFG) = A correction (provided by the engine manufacturer) to the velocity coefficient CV8 for a Reynolds number effect

$$(\Delta CFG) = 0.2856 \times 10^{-1} - 0.3325 \times 10^{-1}\left(\frac{RN8}{10^5}\right) + 0.1936 \times 10^{-1}\left(\frac{RN8}{10^5}\right)^2 - 0.5893 \times 10^{-2}\left(\frac{RN8}{10^5}\right)^3 + 0.8682 \times 10^{-3}\left(\frac{RN8}{10^5}\right)^4 - 0.4577 \times 10^{-4}\left(\frac{RN8}{10^5}\right)^5$$

$(\Delta CFGSW)$ = A correction to the momentum balance thrust for exhaust gas swirl determined from test measurements

$(\Delta CFGSW) = 0.0017$

Thrust Coefficient

(U) Thrust coefficient was calculated by the following equation:

$$CFG = \frac{FJS}{FJISEN}$$

CORRECTED PARAMETERS

(U) Performance parameters were corrected by the following equations:

Corrected Airflow,

$$W2^* = \frac{W2\sqrt{\theta}}{\delta}$$

where

$$\theta = T2/518.7°R$$

$$\delta = P2/14.696\ \text{psia}$$

Corrected Rotor Speed,

$$N^* = N/\sqrt{\theta}$$

Corrected Fuel Flow,

$$WF^* = \frac{WF}{\delta\sqrt{\theta}}$$

Corrected Turbine Discharge Temperature (T51*),

$$T51^* = \frac{T51}{\theta}$$

ALTITUDE AND MACH NUMBER

(U) Altitude and Mach number were calculated using an iterative process as described below:

Step 1. Using measured cell pressure (P_O) for the first approximation, the altitude and static temperature (T_O) corresponding to this ambient pressure were calculated.

Step 2. For a temperature ratio of $T2/T_O$, the flight Mach number was calculated.

Step 3. For the above calculated Mach number, the corresponding total-to-static pressure ratio ($P2/P_{O_X}$) was calculated.

Step 4. From the ($P2/P_{O_X}$), P_O, and a ram pressure recovery (NR), it was possible to calculate $P2'$.

Step 5. When comparing $P2'$ with the measured value of P2, if they did not agree within 0.0002, a new value was assumed for P_O and entered into Step 1 until $|P2' - P2| \leqq 0.0002$.

(U) The equations used in this process are as follows:

(U) For $P_{O_X} \geq 14.696$ psia,

$$T_o = 518.67\,^\circ R$$

$$\text{Altitude} = 0 \text{ ft}$$

(U) For $3.2826 \leq P_{O_X} \leq 14.696$ psia,

$$T_o = \left[518.67 \left(\frac{14.696}{P_{o_X}}\right)^{-0.19026}\right]_{^\circ R}$$

$$\text{Altitude} = \left[\frac{(T_o - 518.67)}{-0.0035662}\right]_{ft}$$

(U) For $0.79406 \leq P_{O_X} \leq 3.2826$ psia,

$$T_o = 389.97\,^\circ R$$

$$\text{Altitude} = \left[36{,}089 - \frac{\log_e\left(\frac{P_{o_X}}{3.2826}\right)}{4.8064 \times 10^{-5}}\right]_{ft}$$

(U) For $0.12589 \leq P_{oX} \leq 0.79406$ psia,

$$T_o = \left[389.97\left(\frac{0.79406}{P_{oX}}\right)^{0.029271}\right]_{^\circ R}$$

$$\text{Altitude} = \left[\frac{T_o - 389.97}{5.4864 \times 10^{-4}} + 65{,}617\right]_{ft}$$

(U) For $1.6086 \times 10^{-2} \leq P_{oX} \leq 0.12589$ psia,

$$T_o = \left[411.57\left(\frac{0.12589}{P_{oX}}\right)^{0.089196}\right]_{^\circ R}$$

$$\text{Altitude} = \left[\frac{T_o - 411.57}{1.5362 \times 10^{-3}} + 104{,}987\right]_{ft}$$

(U) For $P_{oX} < 1.6086 \times 10^{-2}$ psia,

$$T_o = 487.17\ ^\circ R$$

$$\text{Altitude} = 154{,}200\ ft$$

then

$$MO = \sqrt{\frac{2}{\gamma - 1}\left(\frac{T_2}{T_o} - 1\right)}$$

and

$$\left(\frac{P2}{P_o}\right)_X = \left(1 + \frac{\gamma - 1}{2} MO^2\right)^{\frac{\gamma}{\gamma - 1}}$$

hence

$$P2' = \left(\frac{P2}{P_o}\right)_X \times P_{oX} \times RAM$$

where

$$RAM = 0.99$$

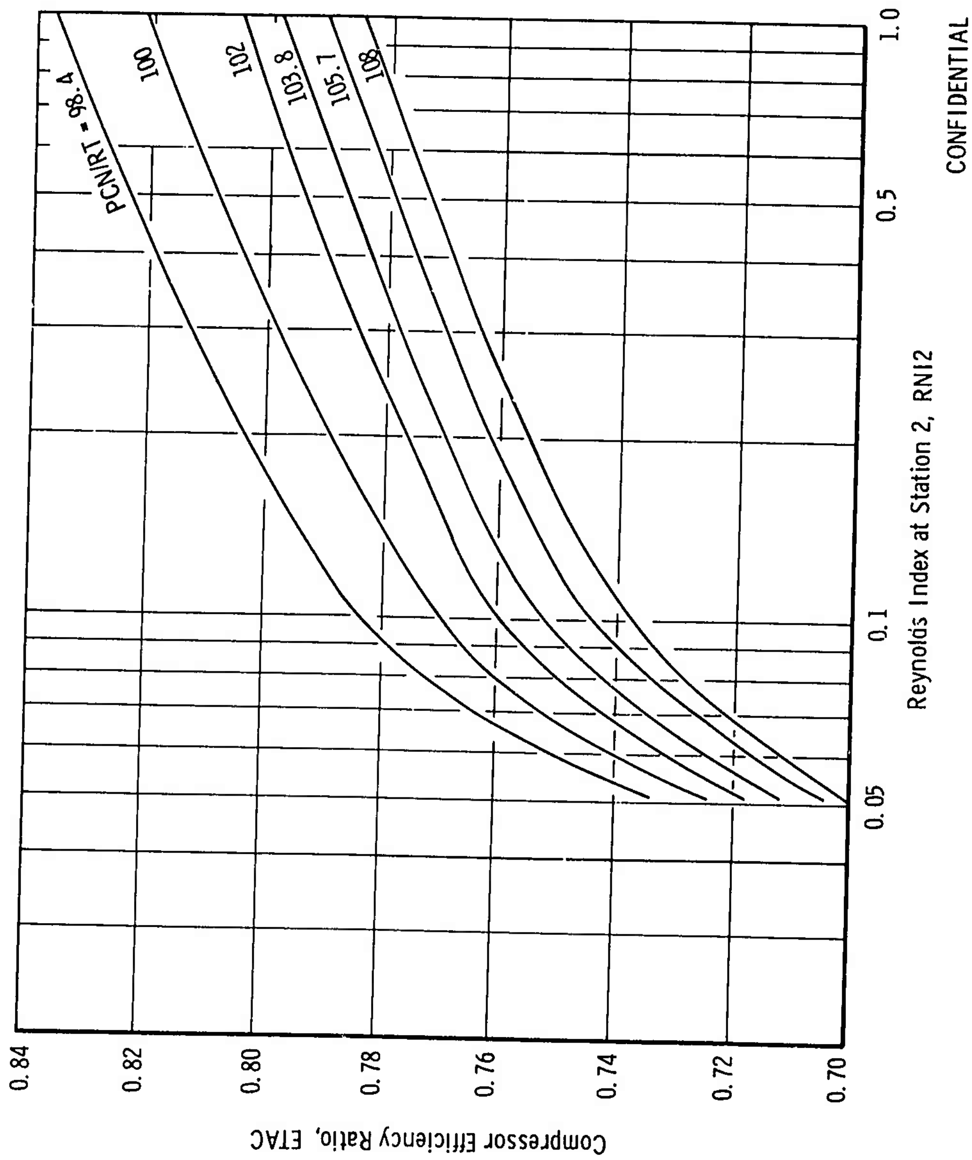

Fig. III-1 Compressor Efficiency as a Function of Reynolds Index at Sta. 2

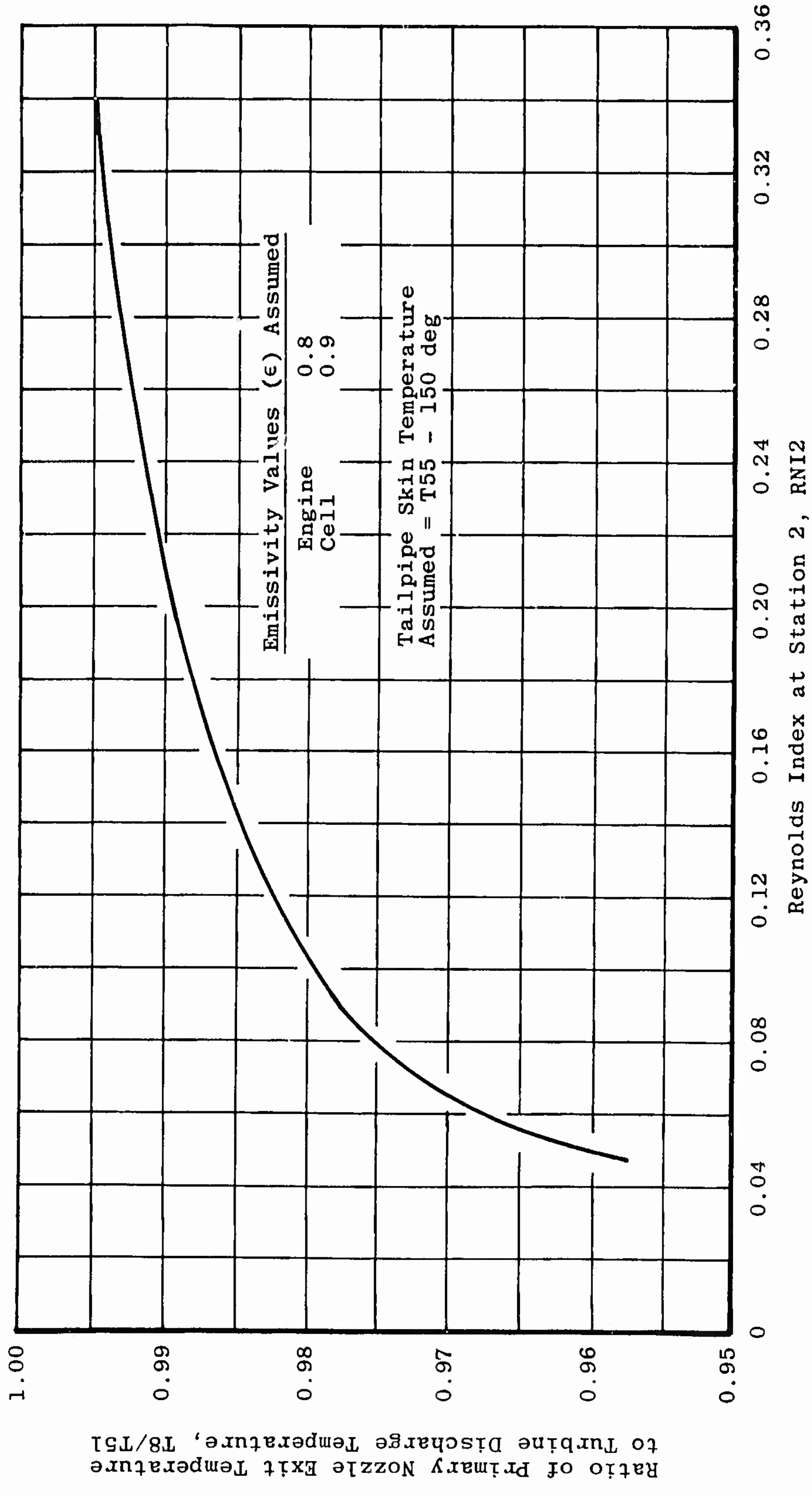

Fig. III-2 Ratio of T8 to T51 for J97 Engine without Tailpipe Blanket

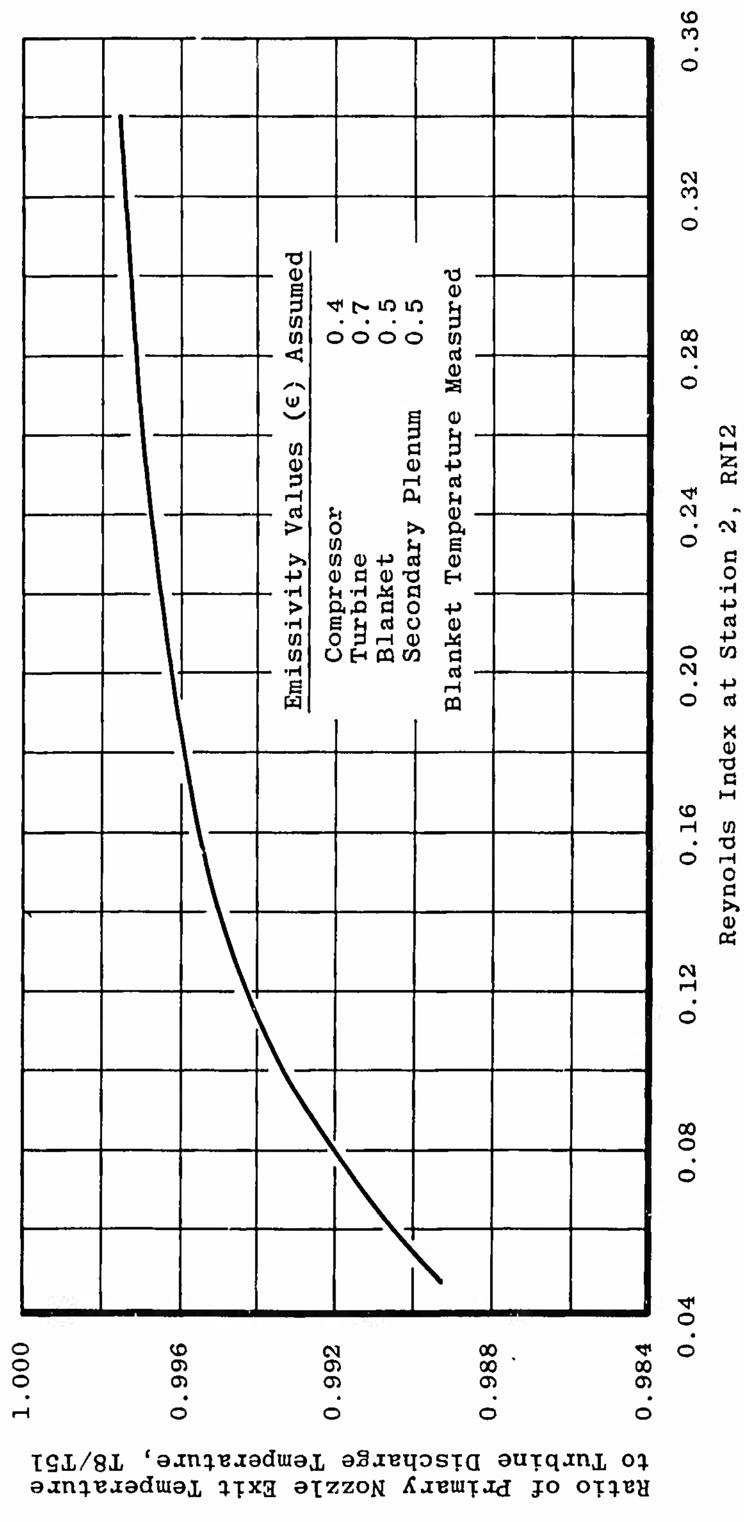

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Fig. III-3 Ratio of T8 to T51 for J97 Engine with Tailpipe Blanket

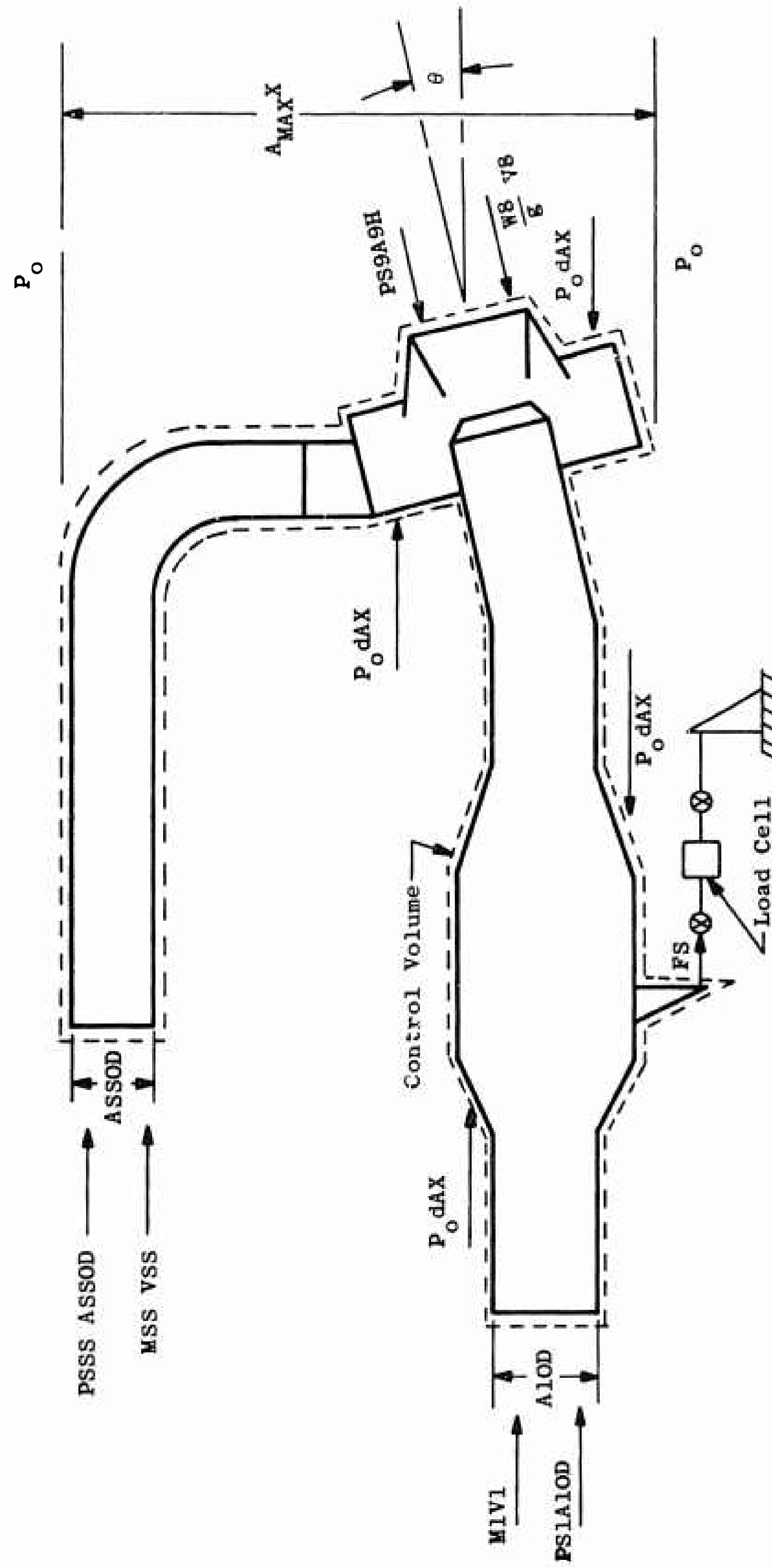

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Fig. III-4 Gross Thrust Calculation

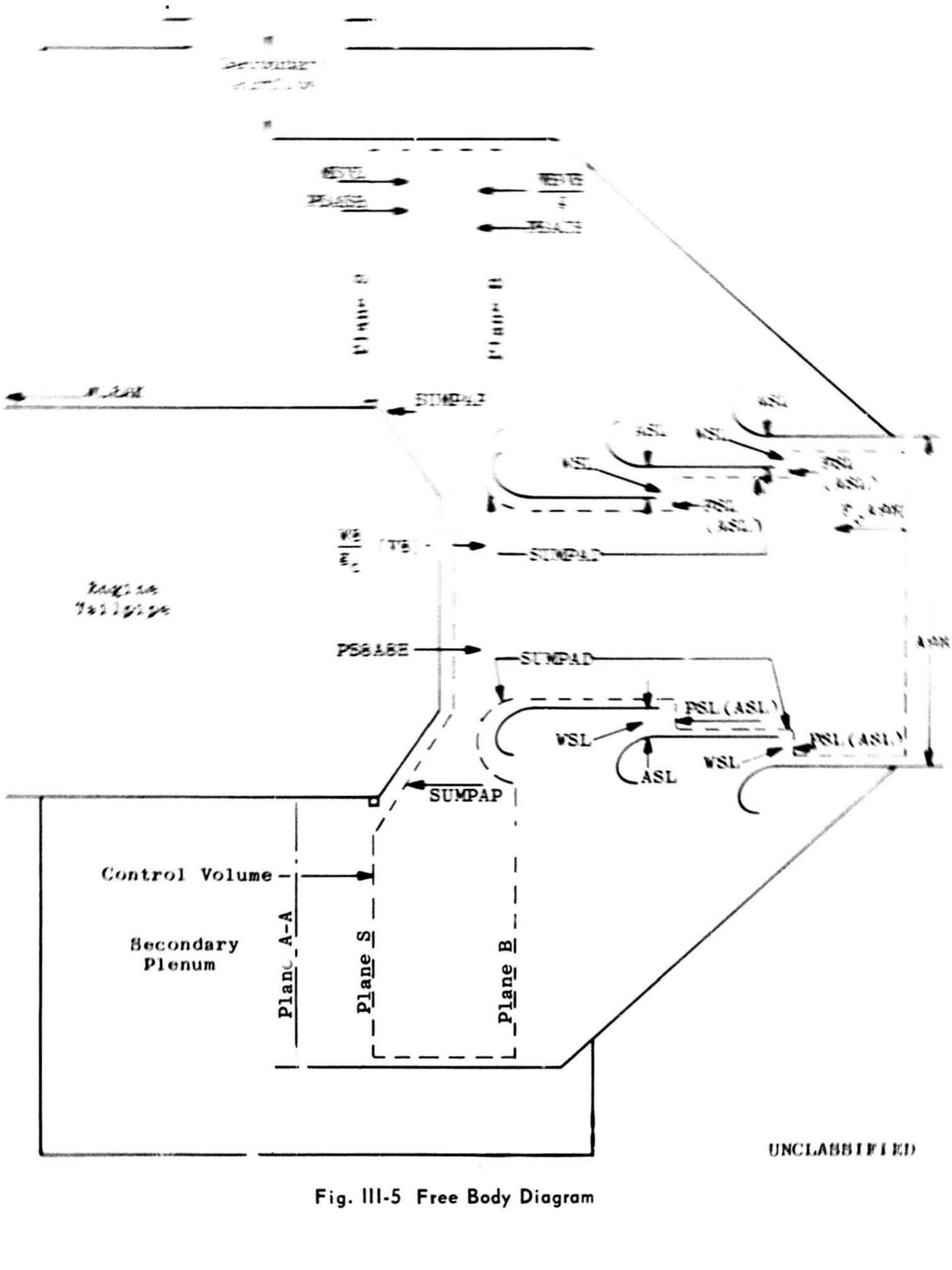

Fig. III-5 Free Body Diagram

APPENDIX IV
TABULATED STEADY-STATE DATA

(U) Each set of test data is identified as shown in the following:

Heading	Definition
Date 6/3/68	Final computer run date June 3, 1968
Group 1	Downgrading classification
ARO, Inc., Arnold Air Force Station, Tennessee 37389	ARO address
CONFIDENTIAL	Security classification
T4-RD0820-03	Test number identified as: T-4 Test cell; RD0820 Project number; 03 Test number
Offline performance data	Computed offline
Test date 02-05-68	Date test data obtained
Time, 1810 hr, 1 sec	Time of day data were computed
Configuration 3.2	Data reduction computer program configuration number
Data point 6.0	Data point number 6.0

(U) Values are listed showing the sign, four significant digits, and the sign and associated power of 10; e.g.,

$$0.9548 - 01 = 0.9548 \times 10^{-1} = 0.09548$$

and

$$-0.9548 + 02 = -0.9548 \times 10^{2} = -95.48$$

PERFORMANCE PRINTOUT NOMENCLATURE

Tabulated Data Symbol	Report Symbol	Parameter
(ALT)D		Altitude (calculated), ft
(MO)D		Free-stream Mach number (calculated)
DTO	DTO	Off standard temperature, ±°F
PLA		Power lever angle, deg
N	N	Rotor speed, rpm
PCN	PCN	Percent rotor speed
FS	FS	Scale force, lb_f
WFE	WF	Engine fuel flow, lb_m/hr
SA	SA	Stator angle, deg
HL	h_L	Lower heating value of fuel, Btu/lb_m
WCW	WCW	Auxiliary oil cooler cooling water flow, lb_m/hr
TT1D	TT1D	Venturi discharge temperature, °R
T2	T2	Compressor inlet total temperature, °R
T3	T3	Compressor discharge total temperature, °R
T3.9CALC	T39X	Combustor discharge total temperature (calculated), °R
T4CALC	T4X	Turbine inlet total temperature (calculated), °R
T5CALC	T5X	Turbine discharge total temperature (calculated), °R
T5.1CALC	T51X	Turbine discharge total temperature (calculated), °R
T5.5AVG	T55	Turbine discharge harness total temperature, °R
TOR	TOR	Secondary airflow orifice total temperature, °R
TTS	T17	Secondary air plenum total temperature, °R
POO	POO	Venturi inlet total pressure, psia
PSINA	PSINA	Small venturi throat static pressure, psia

Tabulated Data Symbol	Report Symbol	Parameter
PSINB	PSINB	Large venturi throat static pressure, psia
PSI	PSI	Engine inlet duct static pressure, psia
P2	P2	Compressor inlet total pressure, psia
PS2	PS2	Compressor inlet static pressure, psia
P2DIST		Percent difference between maximum and minimum P2
P3X	P3	Compressor discharge total pressure (calculated), psia
PS3	PS3	Compressor discharge static pressure, psia
PS3CALC	PS3X	Compressor discharge static pressure, (calculated), psia
P4CALC	P4X	Turbine inlet total pressure (calculated), psia
P5.2	P52	Turbine discharge total pressure (calculated), psia
P7	P7	Nozzle inlet total pressure, psia
PLS	PLS	Exhaust nozzle lip external static pressure, psia
PSSPIPE	PSSS	Static pressure - secondary supply pipe at labyrinth seal, psia
PSOR1	PSOR1	Secondary airflow orifice upstream pressure, psia
PSOR2	PSOR2	Secondary airflow orifice downstream pressure, psia
PTS	P17	Secondary air plenum total pressure, psia
PO	P_o	Test cell pressure, psia
PSINA/POO	PSINA/POO	Small venturi throat pressure ratio
PSINB/POO	PSINB/POO	Large venturi throat pressure ratio
P2/PO	$P2/P_o$	Compressor inlet/test cell pressure ratio
P3/P2	P3/P2	Compressor pressure ratio

Tabulated Data Symbol	Report Symbol	Parameter
PS3/P3	PS3/P3	Compressor discharge static/total pressure ratio
P3/P5.2	P3/P52	Compressor discharge/turbine discharge pressure ratio
P4/P3GE		Calculated turbine inlet to compressor discharge pressure ratio
P5.2/P2	P52/P2	Turbine discharge to compressor inlet pressure ratio
P5.2/PO	$P52/P_o$	Turbine discharge to test cell pressure ratio
P7/PO	$P7/P_o$	Nozzle pressure ratio
T3/T2	T3/T2	Compressor temperature ratio
T5.1CALC/T2		Engine temperature ratio
WAINA	WAINA	Small venturi airflow, lb_m/sec
WAINB	WAINB	Large venturi airflow, lb_m/sec
WAIN	WAIN	Total venturi measured airflow, lb_m/sec
WA2GE		Station 2 measured airflow, lb_m/sec
WC3	WC3	Cooling air removed from Station 3 dumped into main gas stream at station 4.0, lb_m/sec
WC4	WC4	Cooling air removed from Station 3 dumped into main gas stream at station 5.0, lb_m/sec
WA3.1	W31	Combustor inlet airflow, lb_m/sec
PS8/P7	PS8/P7	Nozzle throat static/nozzle inlet total pressure ratio
WA5.1		Turbine discharge airflow, lb_m/sec
WSM	WSM	Measured secondary airflow, lb_m/sec
WSL	WLEAK	Airflow leakage from secondary nozzle plenum to cell, lb_m/sec
WPL	WPL	Airflow leakage through primary nozzle flaps, lb_m/sec
WS	W17	Secondary air entering nozzle, lb_m/sec
WG3.9	W39	Combustor discharge gas flow, lb_m/sec
WG4	W4	Turbine inlet gas flow, lb_m/sec

Tabulated Data Symbol	Report Symbol	Parameter
WG5.1	W51	Turbine discharge gas flow, lb_m/sec
WG8	W8	Primary nozzle gas flow, lb_m/sec
WA4		Turbine inlet airflow, lb_m/sec
FE3.9	F39	Fuel air ratio combustor exit
FE4	F4	Fuel air ratio turbine inlet
FE5.1	F51	Fuel air ratio turbine exit
HPE	HPE	Work extracted from engine rotor, HP
QSW	QSW	Heat absorbed by water in auxiliary oil cooler, Btu/hr
EFFCOMP	ETAC	Compressor efficiency
EFFBURN		Burner efficiency based on calculated T5.1
EFFTURB	ETAT	Turbine efficiency
EFFROTOR		Rotor efficiency
WAIN/WA2GE	WAIN/WA2GE	Venturi measured/Station 2 measured airflow ratio
DH4-5T4		Enthalpy drop across turbine/T4CALC
VR3		Combustor reference velocity, ft/sec
CIP		Combustor inlet parameter
WRT/P4CALC		Turbine inlet parameter W T/P
WRT/P5.2		Turbine exit parameter W T/P
TPL5.2		Tailpipe pressure loss parameter, (P52-P7)/P52
M1	M1	Inlet duct Mach number
M3	M3	Mach number at compressor exit
M5.2	M52	Mach number at turbine diffuser exit
MSPIPE	MSS	Mach number in secondary air supply pipe
MS	M17	Mach number entering secondary nozzle
M3EFF		Effective Mach number at compressor discharge

Tabulated Data Symbol	Report Symbol	Parameter
RNI2	RNI2	Reynolds number index at compressor inlet
RN4	RN4	Reynolds number at turbine inlet
RN8	RN8	Reynolds number at primary nozzle throat
RNI4GE		Reynolds number index at turbine inlet (GE-supplied equation)
DELTA2	δ	Ratio of compressor inlet total pressure to sea-level standard atmospheric pressure
THETA2	θ	Ratio of compressor inlet total temperature to sea-level standard atmospheric temperature
VO	VO	Free-stream velocity, ft/sec
VOK		Free-stream velocity, knots
FJS	FJS	Scale force measured jet thrust (along nozzle centerline), lb_f
FR	FD	Ram drag, lb_f
FNS		Measured net thrust (along nozzle centerline), lb_f
SFC		Specific fuel consumption, lb_m/lb_f-hr
FJISEN	FJISEN	Isentropic jet thrust, lb_f
CFG	CFG	Isentropic thrust coefficient
A8EFF	AE8	Effective primary nozzle area, $in.^2$
A8HOT	A8H	Hot primary nozzle area, $in.^2$
TOD		Ambient temperature at calculated altitude and Mach number conditions, °R
POD		Ambient pressure at calculated altitude and Mach number conditions, psia
CFGA		GE thrust coefficient at actual nozzle pressure ratio
CFGD		GE thrust coefficient at nozzle pressure ratio existing with engine at calculated altitude and Mach number conditions
FJSD		Measured jet thrust adjusted to calculated altitude and Mach number conditions, lb_f

Tabulated Data Symbol	Report Symbol	Parameter
FNSD		Measured net thrust adjusted to calculated altitude and Mach number conditions, lb_f
SFCD		Specific fuel consumption adjusted to calculated altitude and Mach number conditions, lb_m/lb_f-hr
NC2	$N/\sqrt{T}$	Corrected rotor speed, rpm
WAINC	W2*	Corrected engine airflow, lb_m/sec
FE5.1C		Corrected fuel air ratio at turbine discharge
WFEC	WF*	Corrected engine fuel flow, lb_m/hr
FJSC		Corrected jet thrust, lb_f
FNSC		Corrected net thrust, lb_f
SFCC		Corrected specific fuel consumption, lb_m/lb_f-hr
PCNC	$PCN/\sqrt{T}$	Percent corrected rotor speed
P3C		Corrected compressor discharge pressure, psia
P5.2C		Corrected turbine discharge pressure, psia
P7C		Corrected nozzle inlet pressure, psia
T3C		Corrected compressor discharge temperature, °R
T5.1C	T51*	Corrected turbine discharge temperature, °R
N/RT4		Corrected turbine rotor speed, rpm
WSRT/WPRT	$\frac{W17}{W51}\sqrt{\frac{T17}{T51}}$	Secondary/primary nozzle adjusted gas flow ratio
EFFBURNGE	ETABM	Burner efficiency based on fuel flow and GE-provided curve
T4CGE		Calculated turbine inlet temperature corrected per GE, °R
T5.1CGE		Calculated turbine discharge temperature corrected per GE, °R
FNSCGE		Measured net thrust corrected per GE, lb_f

Tabulated Data Symbol	Report Symbol	Parameter
WFECGE		Measured engine fuel flow corrected per GE, lb_m/hr
SFCCGE		Specific fuel consumption corrected per GE, lb_m/lb_f-hr
SUMPAP	SUMPAP	Sum of pressure area terms primary nozzle, lb_f
M8V8	M8V8	Momentum of primary nozzle, lb_f
PS8A8	PS8 (A8H)	Pressure area term of primary nozzle, lb_f
MSVS	MSVS	Momentum of air entering secondary nozzle, lb_f
PSSASH	PSASH	Pressure area term for secondary nozzle inlet plane, lb_f
PBACH	PBACH	Pressure area term for plane B of secondary nozzle, lb_f
WBVB/G	$\frac{WB}{g_c}$ VB	Momentum of air at plane B of secondary nozzle, lb_f
PEA9H	P_o(A9H)	Pressure area term at secondary nozzle exit, lb_f
SUMPAD	SUMPAD	Sum of pressure area terms on secondary nozzle, lb_f
WSLVSL/G	$\frac{WSL}{g_c}$ VSL	Momentum of air exiting slots of secondary nozzle, lb_f
PSLASL	PSL(ASL)	Pressure area term of secondary nozzle slots, lb_f
FJMMB	FJMMB	Jet thrust by momentum balance method, lb_f
FNMMB		Net thrust by momentum balance method, lb_f
SFCMMB		Specific fuel consumption by momentum balance method, lb_m/lb_f-hr
FJMMBD		Jet thrust by momentum balance method, adjusted to calculated altitude and Mach number conditions, lb_f
FNMMBD		Net thrust by momentum balance method, adjusted to calculated altitude and Mach number conditions, lb_f

Tabulated Data Symbol	Report Symbol	Parameter
SFCMMBD		Specific fuel consumption based on momentum balance method, adjusted to calculated altitude and Mach number conditions, lb_m/lb_f-hr
FJMMBC		Corrected jet thrust based on momentum balance method, lb_f
FNMMBC		Corrected net thrust based on momentum balance method, lb_f
SFCMMBC		Corrected specific fuel consumption based on momentum balance method, lb_m/lb_f-hr
FNMMBCGE		Net thrust based on momentum balance, corrected per GE, lb_f
SFCMMBCGE		Specific fuel consumption based on momentum balance method, corrected per GE, lb_m/lb_f-hr
WHF	WHF	Torque motor hydraulic fluid flow rate, lb_m/hr
WA2GEC		Station 2.0 calculated airflow-corrected $= \frac{WA2GE\ \theta 2}{\delta 2}$, lb_m/sec
PSLS		Labyrinth seal cavity pressure, psia
PS2W		Station 2.0 wall static pressure, psia
PS7		Station 7 static pressure, psia
CD		Station 8 discharge coefficient
P2P		Test cell inlet plenum chamber static pressure, psia
D-DPOO(+)		Maximum deviation of DPOO above DPOO average, psid
D-DPOO(-)		Maximum deviation of DPOO below DPOO average, psid
D-DPOO-I(+)		Maximum deviation of DPOO-I above DPOO-I average, psid
D-DPOO-I(-)		Maximum deviation of DPOO-I below DPOO-I average, psid
D-DPO(+)		Maximum deviation of DPO above DPO average, psid

Tabulated Data Symbol	Report Symbol	Parameter
D-DPO(-)		Maximum deviation of DPO below DPO average, psid
DPOO AV		Average change in venturi inlet pressure over the time required to record each data point, psid
DPOO IAV		Average change in venturi inlet pressure over time required to record each data point, psid
DPO AV		Average change in test cell pressure over the time required to record each data point, psid
T8	T8	Exhaust nozzle inlet temperature, adjusted for engine thermal losses

TABLE IV-1
STEADY-STATE DATA SUMMARY

Desired Test Conditions				
Altitude, ft	Mach Number	PCN/RT Percent	Run Number	Data Point Number
36,089	0.6	102.0	3	6
		101.8		7
		103.8		8
		103.9		9
		106.5		10
36,089	0.6	106.4	3	11
N	0.8	103.3	9	2
		102.8		3
		105.3		15
		105.0		16
		105.1		17
		105.1		18
		107.3		20
		107.3		21
		107.3		22
		107.3		23
		103.2		25
N	0.8	103.3	9	26
N + 5000	0.85	105.2	9	31
		105.2		32
		105.2		33
		105.2		34
		107.4		35
N + 5000	0.85	107.4	9	38

DATE= 6/ 3/68
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T4-RD0820-03 OFFLINE PERFORMANCE DATA TEST DATE 02-05-68 TIME 1810 HRS 1 SEC CONFIGURATION 3.2 DATA PT. 6.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
.4036+05	.8245+00	.0000+00	.8900+02	.1286+05	.9423+02	.9575+03	.1088+04	.5084+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOH
.0000+00	.4344+03	.4430+03	.1056+04	.2089+04	.2039+04	.1467+04	.1440+04	.1436+04	.5378+03
TTS	POO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.5897+03	.1053+02	.5139+01	.5316+01	.3674+01	.4135+01	.3375+01	.7112+00	.5656+02	.5307+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.5302+02	.5372+02	.1195+02	.1160+02	.3695+01	.4726+01	.4752+01	.3328+01	.3699+01	.2808+01
PSINA/POO	PSINB/POO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4880+00	.5048+00	.1473+01	.1368+02	.9383+00	.4734+01	.9498+00	.2889+01	.4255+01	.4133+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2384+01	.3251+01	.8293+01	.1338+02	.2167+02	.2191+02	.1517+01	.1070+01	.1908+02	.3185+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.2167+02	.1629+01	.1238+00	.0000+00	.1505+01	.1938+02	.2045+02	.2197+02	.2197+02	.2015+02
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.1584-01	.1499-01	.1394-01	.1941+02	.0000+00	.7893+00	.9830+00	.9047+00	.8470+00	.9889+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7788-01	.6486+02	.1476+03	.1719+02	.6978+02	.2887-01	.4220+00	.3058+00	.5416+00	.1689+00
MS	M3EFF	RNI2	RN4	RN8	RNI4GE	DELTA2	THETA2	VO	VOK
.4005-01	.3080+00	.3451+00	.9454+05	.1038+07	.3471+00	.2813+00	.8540+00	.7555+03	.4476+03
FJS	FR	FNS	SFC	FJISEN	CFG	A8EFF	A8HOT	TOD	POD
.1656+04	.5442+03	.1112+04	.9781+00	.1652+04	.1002+01	.1367+03	.1403+03	.3900+03	.2673+01
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9955+00	.9962+00	.1681+04	.1106+04	.9834+00	.1392+05	.7118+02	.1633-01	.4184+04	.5887+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRI
.3953+04	.1058+01	.1020+03	.2010+03	.4247+02	.4124+02	.1237+04	.1686+04	.2849+03	.4392-01

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T4-RD0820-03 OFFLINE PERFORMANCE DATA TEST DATE 02-05-68 TIME 1810 HRS 1 SEC CONFIGURATION 3,2 DATA PT, 6,0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9850+00	.2391+04	.1689+04	.3978+04	.4310+04	.1083+01	.1244+03	.1130+04	.8753+03	.2229+01
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMMB	SFCMMB
.9878+03	.8961+03	.1957+01	.5726+03	-.7201+02	.1088+02	.6909+02	.1655+04	.1110+04	.9797+00
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.1679+04	.1104+04	.9850+00	.5881+04	.3947+04	.1060+01	.3972+04	.1085+01	.7816+04	.7198+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.3675+01	.3387+01	.9027+01	.9745+00	.4153+01	.1315-02	-.1223-02	.5457-11	.5[illegible]57-11	.6451-03
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.6549-03	.5270-02	.4088+00	.1502-02	.1434+04					

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T4-RD0820-03 OFFLINE PERFORMANCE DATA TEST DATE 02-05-68 TIME 1812 HRS 7 SEC CONFIGURATION 3,2 DATA PT, 7,0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
,4073+05	,8282+00	,0000+00	,8900+02	,1285+05	,9417+02	,9451+03	,1073+04	,5088+02	,1861+05
WCW	TT1D	T2	T3	T3,9CALC	T4CALC	T5,0CALC	T5,1CALC	T5,5AVG	TOR
,0000+00	,4349+03	,4435+03	,1061+04	,2094+04	,2044+04	,1468+04	,1441+04	,1433+04	,5376+03
TIS	POO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
,5896+03	,1038+02	,5064+01	,5241+01	,3622+01	,4076+01	,3330+01	,1603+01	,5656+02	,5307+02
PS3CALC	P4CALC	P5,2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
,5311+02	,5379+02	,1178+02	,1144+02	,3673+01	,4701+01	,4729+01	,3296+01	,3666+01	,2793+01
PSINA/POO	PSINB/POO	P2/PO	P3/P2	PS3/P3	P3/P5,2	P4/P3GE	P5,2/P2	P5,2/PO	P7/PO
,4877+00	,5049+00	,1459+01	,1388+02	,9383+00	,4800+01	,9511+00	,2890+01	,4218+01	,4096+01
T3/T2	T5,1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3,1	PS8/P7
,2393+01	,3249+01	,8171+01	,1318+02	,2135+02	,2156+02	,1495+01	,1055+01	,1880+02	,3210-00
WA5,1	WSM	WSL	WPL	WS	WG3,9	WG4	WG5,1	WG8	WA4
,2135+02	,1628+01	,1222+00	,00[illegible]+00	,1506+01	,1910+02	,2015+02	,2165+02	,2165+02	,1986+02
FE3,9	FE4	FE5,1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
,1584-01	,1500-01	,1395-01	,2002+02	,0000+00	,7900+00	,9829+00	,9021+00	,8461+00	,9901+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5,2	TPL5,2	M1	M3	M5,2	MSPIPE
,7831-01	,6422+02	,1498+03	,1694+02	,6975+02	,2888-01	,4214+00	,3057+00	,5413+00	,1698+00
MS	M3EFF	RNI2	RN4	RN8	RNI4GE	DELTA2	THETA2	VO	VOK
,4044-01	,3039+00	,3397+00	,9303+05	,1023+07	,3467+00	,2774+00	,8550+00	,7476+03	,4429+03
FJS	FR	FNS	SFC	FJISEN	CFG	ABEFF	ABHOT	TOD	POD
,1626+04	,5311+03	,1095+04	,9795+00	,1624+04	,1001+01	,1366+03	,1403+03	,3900+03	,2626+01
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5,1C	WFEC	FJSC
,9959+00	,9968+00	,1657+04	,1087+04	,9864+00	,1390+05	,7118+02	,1632-01	,4182+04	,5863-04
FNSC	SFCC	PCNC	P3C	P5,2C	P7C	T3C	T5,1C	N/RT4	WSRT/WPRT
,3948+04	,1059+01	,1018+03	,2039+03	,4248+02	,4125+02	,1241+04	,1685+04	,2843+03	,4461-01

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T4-RD0820-03 OFFLINE PERFORMANCE DATA TEST DATE 02-05-68 TIME 1812 HRS 7 SEC CONFIGURATION 3.2 DATA PT. 7.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9850+00	.2394+04	.1688+04	.3973+04	.4307+04	.1084+01	.1239+03	.1114+04	.8631+03	.2252+01
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMM8	FNMM8	SFCMM8
.9812+03	.8894+03	.2111+01	.5696+03	-.7159+02	.1079+02	.6855+02	.1628+04	.1097+04	.9776+00
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.1659+04	.1089+04	.9645+00	.5870+04	.3955+04	.1057+01	.3980+04	.1082+01	.7819+04	.7189+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.3621+01	.3347+01	.8902+01	.9738+00	.4092+01	.1776-02	-.9541-03	.5457-11	.5457-11	.8137-03
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.7496-03	.5646-02	.4088+00	.1202-02	.1434+04					

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GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-03 OFFLINE PERFORMANCE DATA TEST DATE 02-05-68 TIME 1814 HRS 12 SEC CONFIGURATION 3.2 DATA PT. 8.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
.4070+05	.8313+00	.0000+00	.9500+02	.1310+05	.9600+02	.9910+03	.1129+04	.5082+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4355+03	.4439 03	.1068+04	.2140+04	.2087+04	.1509+04	.1480+04	.1473+04	.5373+03
TTS	P00	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.5950+03	.1049+02	.5116+01	.5294+01	.3634+01	.4096+01	.3334+01	.7568+00	.5656+02	.5307+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.5302+02	.5371+02	.1205+02	.1171+02	.3674+01	.4577+01	.4599+01	.3337+01	.3670+01	.2792+01
PSINA/POO	PSINB/POO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4879+00	.5048+00	.1467+01	.1381+02	.9383+00	.4692+01	.9496+00	.2943+01	.4318+01	.4193+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2406+01	.3334+01	.8249+01	.1331+02	.2155+02	.2179+02	.1509+01	.1065+01	.1898+02	.3139+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.21[illegible]+02	.1525+01	.1220+00	.0000+00	.1403+01	.1929+02	.2036+02	.2187+02	.2187+02	.2005+02
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.1652-01	.1564-01	.1455-01	.2400+02	.0000+00	.7803+00	.9826+00	.9035+00	.8419+00	.9892+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7746-01	.6525+02	.1484+03	.1732+02	.6979+02	.2889-01	.4241+00	.3057+00	.5423+00	.1633+00
MS	M3EFF	RN12	RN4	RN8	RN14GE	DELTA2	THETA2	VO	VOK
.3781-01	.3082+00	.3410+00	.9280+05	.1016+07	.3382+00	.2787+00	.8557+00	.7530+03	.4462+03
FJS	FR	FNS	SFC	FJISEN	CFG	A8EFF	A8HOT	TOD	POD
.1674+04	.5373+03	.1136+04	.9934+00	.1675+04	.9994+00	.1368+03	.1404+03	.3900+03	.2630+01
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9931+00	.9940+00	.1704+04	.1129+04	.9995+00	.1417+05	.7154+02	.1700-01	.4378+04	.6005+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4077+04	.1074+01	.1038+03	.2029+03	.4325+02	.4200+02	.1248+04	.1729+04	.2868+03	.4077-01

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ARO,INC,
ARNOLD AIR FORCE STATION,TENN

T4-RD0820-03 OFFLINE PERFORMANCE DATA TEST DATE 02-05-68 TIME 1814 HRS 12 SEC CONFIGURATION 3,2 DATA PT, 8,0

EFFBURNGE	T4CGE	T5,1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
,9850+00	,2443+04	,1732+04	,4103+04	,4508+04	,1099+01	,1241+03	,1139+04	,8843+03	,1971+01
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMMB	SFCMMB
,9813+03	,8895+03	,1680+01	,5695+03	-,7099+02	,1001+02	,6882+02	,1675+04	,1138+04	,9923+00
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
,1705+04	,1131+04	,9985+00	,6009+04	,4081+04	,1073+01	,4107+04	,1098+01	,7790+04	,7232+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
,3597+01	,3349+01	,9107+01	,9744+00	,4112+01	,9533-03	-,2038-02	,1947-02	-,1324-02	,5878-03
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-,4311-03	,4550-02	-,1082-02	,3735-03	,1473+04					

OFFLINE

DATE= 6/ 3/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-03 OFFLINE PERFORMANCE DATA TEST DATE 02-05-68 TIME 1816 HRS 17 SEC CONFIGURATION 3,2 DATA PT. 9.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
.4056+05	.8270+00	.0000+00	.9500+02	.1311+05	.9601+02	.9941+03	.1130+04	.5083+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4351+03	.4433+03	.1066+04	.2136+04	.2084+04	.1506+04	.1477+04	.1471+04	.5372+03
TTS	POO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.5953+03	.1051+02	.5132+01	.5303+01	.3642+01	.4106+01	.3343+01	.7291+00	.5656+02	.5307+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.5300+02	.5370+02	.1210+02	.1175+02	.3681+01	.4581+01	.4607+01	.3344+01	.3677+01	.2794+01
PSINA/POO	PSINB/POO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4882+00	.5045+00	.1470+01	.1377+02	.9383+00	.4676+01	.9494+00	.2946+01	.4330+01	.4204+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2405+01	.3332+01	.8272+01	.1334+02	.2162+02	.2185+02	.1513+01	.1068+01	.1903+02	.3134+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.2162+02	.1526+01	.1223+00	.0000+00	.1404+01	.1935+02	.2042+02	.2193+02	.2193+02	.2010+02
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.1649-01	.1561-01	.1452-01	.2411+02	.0000+00	.7799+00	.9826+00	.9051+00	.8425+00	.9692+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7743-01	.6532+02	.1480+03	.1736+02	.6968+02	.2888-01	.4250+00	.3058+00	.5411+00	.1633+00
MS	M3EFF	RNI2	RN4	RN8	RNI4GE	DELTA2	THETA2	VO	VOK
.3779-01	.3089+00	.3423+00	.9315+05	.1020+07	.3387+00	.2794+00	.8547+00	.7540+03	.4467+03
FJS	FR	FNS	SFC	FJISEN	CFG	A8EFF	A8HOT	TOD	POD
.1680+04	.5395+03	.1141+04	.9906+00	.1679+04	.1000+01	.1366+03	.1404+03	.3900+03	.2648+01
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9931+00	.9939+00	.1707+04	.1134+04	.9962+00	.1418+05	.7152+02	.1699-01	.4375+04	.6013+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4083+04	.1072+01	.1039+03	.2024+03	.4329+02	.4204+02	.1248+04	.1729+04	.2871+03	.4074-01

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GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-03 OFFLINE PERFORMANCE DATA TEST DATE 02-05-68 TIME 1816 HRS 17 SEC CONFIGURATION 3.2 DATA PT. 9.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9850+00	.2442+04	.1731+04	.4108+04	.4506+04	.1097+01	.1243+03	.1142+04	.8873+03	.1972+01
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMMB	SFCMMB
.9834+03	.8912+03	.1884+01	.5699+03	-.7114+02	.9996+01	.6895+02	.1680+04	.1141+04	.9904+00
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.1707+04	.1135+04	.9959+00	.6014+04	.4083+04	.1071-01	.4109+04	.1096+01	.7769+04	.7230+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.3615+01	.3355+01	.9139+01	.9730+00	.4123+01	.1504-02	-.8512-03	.1105-02	-.1107-02	.5381-03
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.9265-03	.5038-02	-.7330-04	.8442-03	.1470+04					

OFFLINE

DATE= 6/ 3/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

T4-RD0820-03 OFFLINE PERFORMANCE DATA TEST DATE 02-05-68 TIME 1818 HRS 22 SEC CONFIGURATION 3.2 DATA PT. 10.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
.4042+05	.8254+00	.0000+00	.1270+03	.1343+05	.9841+02	.1043+04	.1197+04	.5089+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4347+03	.4431+03	.1073+04	.2189+04	.2135+04	.1555+04	.1523+04	.1517+04	.5381+03
TTS	PUO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.6047+03	.1062+02	.5190+01	.5366+01	.3657+01	.4126+01	.3350+01	.1162+01	.5656+02	.5307+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.5290+02	.5361+02	.1242+02	.1206+02	.3685+01	.4467+01	.4487+01	.3413+01	.3684+01	.2783+01
PSINA/PUO	PSINB/PUO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4886+00	.5052+00	.1483+01	.1371+02	.9383+00	.4554+01	.9478+00	.3010+01	.4463+01	.4334+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2421+01	.3438+01	.8362+01	.1349+02	.2185+02	.2206+02	.1530+01	.1079+01	.1924+02	.3055+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.2185+02	.1407+01	.1224+00	.0000+00	.1285+01	.1957+02	.2065+02	.2218+02	.2218+02	.2032+02
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.1728-01	.1637-01	.1522-01	.2088+02	.0000+00	.7691+00	.9830+00	.9056+00	.8373+00	.9905+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7633-01	.6643+02	.1464+03	.1780+02	.6970+02	.2889-01	.4274+00	.3058+00	.5421+00	.1545+00
MS	M3EFF	RNI2	RN4	RN8	RNI4GE	DELTA2	THETA2	VO	VOK
.3478-01	.3137+00	.3442+00	.9291+05	.1012+07	.3293+00	.2807+00	.8543+00	.7616+03	.4512+03
FJS	FR	FNS	SFC	FJISEN	CFG	ABEFF	ABHOT	TOD	PUD
.1736+04	.5476+03	.1188+04	.1008+01	.1741+04	.9968+00	.1367+03	.1405+03	.3900+03	.2665+01
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9902+00	.9908+00	.1758+04	.1183+04	.1012+01	.1453+05	.7194+02	.1782-01	.4614+04	.6182+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4231+04	.1090+01	.1065+03	.2015+03	.4424+02	.4297+02	.1256+04	.1783+04	.2907+03	.3658-01

OFFLINE

DATE= 6/ 3/68
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ARO,INC,
ARNOLD AIR FORCE STATION,TENN

T4-RD0820-03 OFFLINE PERFORMANCE DATA TEST DATE 02-05-68 TIME 1818 HRS 22 SEC CONFIGURATION 3,2 DATA PT, 10,0

EFFBURNGE	T4CGE	T5,1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
,9850+00	,2503+04	,1786+04	,4258+04	,4753+04	,1116+01	,1242+03	,1171+04	,9130+03	,1674+01
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMMB	SFCMMB
,9851+03	,8909+03	,1249+01	,5680+03	-,7073+02	,8835+01	,6970+02	,1740+04	,1193+04	,1004+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
,1762+04	,1188+04	,1008+01	,6199+04	,4248+04	,1086+01	,4275+04	,1112+01	,7746+04	,7263+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
,3625+01	,3361+01	,9384+01	,9732+00	,4146+01	,1552-02	-,1047-02	,8019-03	-,1298-02	,1087-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-,5669-03	,5870-02	,3131-03	,1028-02	,1516+04					

OFFLINE

DATE= 6/ 3/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

T4-RD0820-03 OFFLINE PERFORMANCE DATA TEST DATE 02-05-68 TIME 1820 HRS 28 SEC CONFIGURATION 3.2 DATA PT. 11.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
.4053+05	.8212+00	.0000+00	.1270+03	.1342+05	.9828+02	.1033+04	.1186+04	.5089+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4342+03	.4426+03	.1074+04	.2191+04	.2137+04	.1555+04	.1524+04	.1516+04	.5381+03
TTS	P00	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.6058+03	.1051+02	.5128+01	.5309+01	.3623+01	.4087+01	.3318+01	.1236+01	.5656+02	.5307+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.5297+02	.5367+02	.1229+02	.1194+02	.3656+01	.4417+01	.4440+01	.3379+01	.3649+01	.2765+01
PSINA/P00	PSINB/P00	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4881+00	.5053+00	.1478+01	.1384+02	.9383+00	.4602+01	.9488+00	.3007+01	.4445+01	.4316+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2428+01	.3443+01	.8276+01	.1335+02	.2163+02	.2187+02	.1514+01	.1068+01	.1904+02	.3063+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.2163+02	.1392+01	.1207+00	.0000+00	.1271+01	.1937+02	.2044+02	.2196+02	.2196+02	.2011+02
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.1730-01	.1638-01	.1523-01	.2021+02	.0000+00	.7693+00	.9831+00	.9018+00	.8356+00	.9886+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7652-01	.6585+02	.1479+03	.1761+02	.6973+02	.2890-01	.4252+00	.3058+00	.5424+00	.1546+00
MS	M3EFF	RNI2	RN4	RN8	RNI4GE	DELTA2	THETA2	VO	VOK
.3477-01	.3103+00	.3415+00	.9190+05	.1002+07	.3292+00	.2781+00	.8532+00	.7584+03	.4493+03
FJS	FR	FNS	SFC	FJISEN	CFG	ABEFF	ABHOT	TOD	POD
.1714+04	.5397+03	.1174+04	.1010+01	.1721+04	.9958+00	.1368+03	.1405+03	.3900+03	.2652+01
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9901+00	.9907+00	.1735+04	.1170+04	.1014+01	.1452+05	.7183+02	.1785-01	.4616+04	.6164+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4223+04	.1093+01	.1064+03	.2034+03	.4420+02	.4292+02	.1259+04	.1786+04	.2902+03	.3659-01

OFFLINE

DATE= 6/ 3/68
GROUP 1
ARO,INC,
ARNOLD AIR FORCE STATION,TENN

T4-RD0820-03 OFFLINE PERFORMANCE DATA TEST DATE 02-05-68 TIME 1820 HRS 28 SEC CONFIGURATION 3,2 DATA PT, 11,0

EFFBURNGE	T4CGE	T5,1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
,9[illegible]50+00	,2509+04	,1789+04	,4250+04	,4756+04	,1119+01	,1235+03	,1159+04	,9034+03	,1657+01
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMMB	SFCMMB
,9766+03	,8832+03	,1433+01	,5644+03	-,7001+02	,8747+01	,6901+02	,1720+04	,1181+04	,1004+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
,1742+04	,1176+04	,1008+01	,6186+04	,4245+04	,1087+01	,4273+04	,1113+01	,7706+04	,7265+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
,3651+01	,3335+01	,9286+01	,9735+00	,4103+01	,2446-02	-,1714-02	,1742-02	-,1120-02	,6286-03
D-DPD(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-,5644-03	,5857-02	-,3387-02	,5891-03	,1516+04					

OFFLINE

DATE= 4/24/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

14-R00820-09 PERFORMANCE 3-14-68 TIME 107 HRS 50 SEC CONFIGURATION 3,2 DATA PT. 2.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
N-40	.7903+00	.0000+00	.9300+02	.1305+05	.9558+02	.2074+03	.2727+03	.5013+02	.1861+05
WC4	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4183+03	.4445+03	.1136+04	.2520+04	.2454+04	.1835+04	.1790+04	.1760+04	.5426+03
TTS	PJC	PSINA	PSINB	PSI	P2	PS2	P2DIST	PSX	PS3
.7229+03	.1796+01	.8761+00	.8694+00	.6856+00	.7596+00	.6426+00	.3224+01	.1122+02	.1070+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.1065+02	.1076+02	.2341+01	.2270+01	.7163+00	.8104+00	.8125+00	.6545+00	.7008+00	.5277+00
PSINA/PJO	PSINB/PJO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4874+00	.4946+00	.1440+01	.1477+02	.9537+00	.4792+01	.9585+00	.3082+01	.4437+01	.4303+01
T5/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2526+01	.4020+01	.1440+01	.2322+01	.3762+01	.3752+01	.2633+00	.1858+00	.3313+01	.3155+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3752+01	.2395+00	.2131-01	.0000+00	.2182+00	.3388+01	.3574+01	.3838+01	.3838+01	.3498+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2237-01	.2165-01	.2014-01	.1398+02	.0000+00	.7286+00	.9531+00	.8344+00	.7815+00	.1003+01
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7321-01	.6106+02	.3457+02	.1646+02	.6935+02	.3034-01	.4127+00	.2636+00	.5422+00	.1456+00
MS	M8EFF	RN12	RN4	RN8	RN14GE	DELTA2	THETA2	VO	VOK
.3395-01	.2768+00	.6312-01	.1483+05	.1592+06	.5666-01	.5168-01	.8569+00	.7359+03	.4360+03
FJS	FR	FNS	SFC	FJISEN	CFG	A8EFF	A8HUT	TOD	POD
.3272+03	.9103+02	.2361+03	.1155+01	.3262+03	.1003+01	.1365+03	.1409+03	.3951+03	.5082+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9899+00	.9904+00	.3308+03	.2356+03	.1158+01	.1409+05	.6738+02	.2350-01	.5700+04	.6330+04
FNSC	SFCC	PCNC	PSC	P5.2C	P/C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4569+04	.1248+01	.1033+03	.2171+03	.4530+02	.4393+02	.1326+04	.2089+04	.2633+03	.3637-01

OFFLINE

DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 107 HRS 50 SEC CONFIGURATION 3.2 DATA PT. 2.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9591+00	.2569+04	.2093+04	.4597+04	.5868+04	.1276+01	.2438+02	.2188+03	.1733+03	.3040+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMMB	SFCMMB
.1914+03	.1701+03	.3650+00	.1078+03	-.1372+02	.1728+01	.1312+02	.3284+03	.2374+03	.1149+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.3321+03	.2366+03	.1151+01	.6354+04	.4593+04	.1241+01	.4621+04	.1270+01	.8821+04	.6720+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.7208+00	.6434+00	.1773+01	.9688+00	.7709+00	.8754-02	-.8658-02	.1120-03	-.3858-03	.5282-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.3401-02	-.1545-02	.5037-01	.1446-01	.1774+04					

OFFLINE

DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-R0082U-09 PERFORMANCE 3-14-68 TIME 110 HRS 34 SEC CONFIGURATION 3.2 DATA PT. 3.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
N+400	.8173+00	.0000+00	.9300+02	.1385+05	.9558+02	.2004+03	.2706+03	.5012+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4270+03	.4482+03	.1136+04	.2519+04	.2454+04	.1836+04	.1791+04	.1770+04	.5425+03
TTS	PUO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.7559+03	.1805+01	.8792+00	.8938+00	.8892+00	.7641+00	.6485+00	.2739+01	.1110+02	.1059+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.1052+02	.1063+02	.2329+01	.2258+01	.6811+00	.7862+00	.7888+00	.6459+00	.6837+00	.5148+00
PSINA/PUO	PSINB/PUO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4870+00	.4951+00	.1484+01	.1452+02	.9539+00	.4765+01	.9580+00	.3048+01	.4524+01	.4387+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2538+01	.3996+01	.1432+01	.2308+01	.3740+01	.3731+01	.2618+00	.1848+00	.3293+01	.3016+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3740+01	.2260+00	.2039-01	.0000+00	.2056+00	.3369+01	.3553+01	.3815+01	.3815+01	.3478+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2282-01	.2161-01	.2010-01	.1433+02	.0000+00	.7301+00	.9523+00	.8355+00	.7828+00	.1002+01
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7305-01	.6146+02	.3402+02	.1656+02	.6933+02	.3034-01	.4115+00	.2030+00	.5420+00	.1416+00
MS	M3EFF	RN12	RN4	RN8	RN14GE	DELTA2	THETA2	VO	VOK
.3344-01	.2786+00	.6280-01	.1475+05	.1582+06	.5603-01	.5199-01	.8640+00	.7670+03	.4544+03
FJS	FR	FNS	SFC	FJISEN	CFG	ABEFF	ABHOT	TOD	POD
.3245+03	.9406+02	.2305+03	.1174+01	.3261+03	.9952+00	.1365+03	.1410+03	.3953+03	.4976+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9892+00	.9897+00	.3278+03	.2301+03	.1176+01	.1404+05	.6687+02	.2326-01	.5599+04	.6242+04
FNSC	SFCC	PCNC	P3C	P5.2C	P/C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4433+04	.1263+01	.1028+03	.2134+03	.4479+02	.4343+02	.1317+04	.2073+04	.2634+03	.3517-01

OFFLINE

CONFIDENTIAL

DATE= 4/24/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 110 HRS 34 SEC CONFIGURATION 3.2 DATA PT. 3.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9585+00	.2844+04	.2076+04	.4459+04	.5755+04	.1291+01	.2309+02	.2173+03	.1724+03	.2880+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMM8	SFCMMB
.1835+03	.1648+03	.1192+00	.1053+03	-.1326+02	.1659+01	.1283+02	.3251+03	.2310+03	.1171+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.3283+03	.2306+03	.1173+01	.6253+04	.4444+04	.1260+01	.4470+04	.1288+01	.8737+04	.6671+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.7169+00	.6484+00	.1759+01	.9682+00	.7744+00	.1104-03	-.9725-02	.2319-03	-.3130-03	.2112-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	I8					
-.1725-02	-.1765-01	.5182-01	.1502-01	.1774+04					

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DATE= 4/24/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

T4-R00820-09 PERFORMANCE 3-14-68 TIME 143 HRS 7 SEC CONFIGURATION 3,2 DATA PT. 15.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
N-310	.7569+00	.0000+00	.9750+02	.1330+05	.9745+02	.2157+03	.2883+03	.5023+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4244+03	.4439+03	.1154+04	.2581+04	.2513+04	.1879+04	.1832+04	.1813+04	.5479+03
TTS	PUO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.7966+03	.1852+01	.8998+00	.9153+00	.6878+00	.7670+00	.6411+00	.4215+01	.1174+02	.1119+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.1116+02	.1127+02	.2423+01	.2350+01	.6763+00	.7610+00	.7625+00	.6526+00	.6828+00	.5082+00
PSINA/PUO	PSINB/PUO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4860+00	.4943+00	.1509+01	.1531+02	.9532+00	.4645+01	.9597+00	.3160+01	.4768+01	.4624+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2601+01	.4128+01	.1473+01	.2375+01	.3847+01	.3888+01	.2693+00	.1901+00	.3388+01	.2878+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3847+01	.1973+00	.2004-01	.0000+00	.1773+00	.3468+01	.3658+01	.3927+01	.3927+01	.3578+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2363-01	.2236-01	.2081-01	.1851+02	.0000+00	.7210+00	.9585+00	.8329+00	.7769+00	.9896+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7362-01	.6064+02	.3597+02	.1627+02	.6937+02	.3033-01	.4048+00	.2649+00	.5429+00	.1284+00
MS	M3EFF	RNI2	RN4	RN8	RNI4GE	DELTA2	THETA2	VO	VOK
.2962-01	.2723+00	.6384-01	.1497+05	.1607+06	.5784-01	.5219-01	.8557+00	.7778+03	.4609+03
FJS	FR	FNS	SFC	FJISEN	CFG	A8EFF	A8HOT	TOD	POD
.3407+03	.9729+02	.2434+03	.1184+01	.3447+03	.9886+00	.1366+03	.1411+03	.3949+03	.5148+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9857+00	.9855+00	.3395+03	.2436+03	.1183+01	.1438+05	.6819+02	.2432-01	.5971+04	.6529+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4665+04	.1280+01	.1053+03	.2250+03	.4644+02	.4503+02	.1349+04	.2141+04	.2653+03	.2990-01

OFFLINE

DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0620-09 PERFORMANCE 3-14-68 TIME 143 HRS 7 SEC CONFIGURATION 3.2 DATA PT. 15.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9661+00	.2942+04	.2145+04	.4694+04	.6149+04	.1310+01	.2295+02	.2260+03	.1797+03	.2258+00
PSSASH	P8ACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMM8	SFCMMB
.1829+03	.1542+03	.2218+00	.1040+03	-.1320+02	.1432+01	.1302+02	.3419+03	.2446+03	.1179+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.3406+03	.2447+03	.1178+01	.6551+04	.4587+04	.1274+01	.4716+04	.1304+01	.8922+04	.6891+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.7127+00	.6399+00	.1830+01	.9682+00	.7700+00	.1073-01	-.9270-02	.3959-03	-.2879-03	.7409-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.6931-02	-.3416-01	-.2003-01	.5449-02	.1815+04					

OFFLINE

DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 145 HRS 51 SEC CONFIGURATION 3,2 DATA PT. 16.0

(ALT)D	(MO)D	DTO	PLA	N	PLN	FS	WFE	SA	HL
N+110	.8065+00	.0000+00	.9750+02	.1330+05	.9747+02	.2130+03	.2881+03	.5026+02	.1661+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4297+03	.4466+03	.1155+04	.2582+04	.2515+04	.1883+04	.1836+04	.1817+04	.5482+03
TTS	POO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.7989+03	.1858+01	.9010+00	.9178+00	.6894+00	.7666+00	.6420+00	.2748+01	.1155+02	.1101+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.1096+02	.1107+02	.2411+01	.2337+01	.6757+00	.7539+00	.7573+00	.6478+00	.6791+00	.5066+00
PSINA/POO	PSINB/POO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4850+00	.4940+00	.1513+01	.1506+02	.9536+00	.4790+01	.9585+00	.3145+01	.4758+01	.4614+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2585+01	.4111+01	.1469+01	.2368+01	.3837+01	.3859+01	.2686+00	.1895+00	.3379+01	.2891+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3837+01	.1962+00	.1986-01	.0000+00	.1764+00	.3459+01	.3648+01	.3917+01	.3917+01	.3568+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2368-01	.2243-01	.2086-01	.1761+02	.0000+00	.7218+00	.9576+00	.8348+00	.7783+00	.9944+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7329-01	.6150+02	.3589+02	.1653+02	.6962+02	.3033-01	.4035+00	.2639+00	.5458+00	.1290+00
MS	M3EFF	RNI2	RN4	RN8	RNI4GE	DELTA2	THETA2	VO	VOK
.2968-01	.2765+00	.6330-01	.1493+05	.1601+06	.5676-01	.5216-01	.8610+00	.7825+03	.4636+03
FJS	FR	FNS	SFC	FJISEN	CFG	ABEFF	ABHOT	TOD	POD
.3386+03	.9760+02	.2410+03	.1195+01	.3439+03	.9847+00	.1371+03	.1411+03	.3952+03	.5047+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9856+00	.9857+00	.3390+03	.2410+03	.1195+01	.1434+05	.6826+02	.2422-01	.5952+04	.6492+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRI/WPRT
.4621+04	.1288+01	.1050+03	.2214+03	.4622+02	.4481+02	.1341+04	.2133+04	.2653+03	.2984-01

OFFLINE

DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 145 HRS 51 SEC CONFIGURATION 3,2 DATA PT. 16.0

EFFBURNGE	T4CGE	T5,1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9648+00	.2925+04	.2136+04	.4649+04	.6122+04	.1317+01	.2294+02	.2256+03	.1788+03	.2254+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMM8	FNMM8	SFCMM8
.1826+03	.1637+03	.9176-01	.1037+03	-.1315+02	.1375+01	.1300+02	.3412+03	.2436+03	.1183+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.3416+03	.2435+03	.1183+01	.6541+04	.4670+04	275+01	.4698+04	.1303+01	.8877+04	.6864+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.7123+00	.6415+00	.1820+01	.9718+00	.7713+00	.1096-01	-.1072-01	.2457-03	-.3032-03	.3551-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.4234-02	-.3243-01	-.1988-01	.5750-02	.1819+04					

OFFLINE

DATE= 4/24/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

14-R00820-09 PERFORMANCE 3-14-68 TIME 147 HRS 33 SEC CONFIGURATION 3,2 DATA PT. 17.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
N+70	.8346+00	.0000+00	.9750+02	.1330+05	.9745+02	.2136+03	.2877+03	.5026+02	.1861+05
WCW	TT10	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4290+03	.4463+03	.1152+04	.2577+04	.2509+04	.1879+04	.1832+04	.1813+04	.5484+03
TIS	PUO	PSINA	PSINB	PSI	P2	PS2	P2DIST	PSX	PS3
.8121+03	.1057+01	.8997+00	.9161+00	.6884+00	.7665+00	.6424+00	.2765+01	.1148+02	.1095+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.1059+02	.1100+02	.2414+01	.2340+01	.6702+00	.7275+00	.7306+00	.6365+00	.6695+00	.5079+00
PSINA/PUO	PSINB/PUO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4845+00	.4934+00	.1509+01	.1498+02	.9536+00	.4757+01	.9581+00	.3149+01	.4752+01	.4608+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2551+01	.4106+01	.1469+01	.2369+01	.3838+01	.3855+01	.2686+00	.1896+00	.3380+01	.2864+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3838+01	.1801+00	.1904-01	.0000+00	.1611+00	.3460+01	.3649+01	.3918+01	.3918+01	.3569+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2365-01	.2239-01	.2083-01	.1787+02	.0000+00	.7218+00	.9565+00	.8373+00	.7795+00	.9955+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7320-01	.6173+02	.3546+02	.1662+02	.6949+02	.3033-01	.4092+00	.2640+00	.5442+00	.1227+00
MS	MSEFF	RN12	RN4	RN8	RN14GE	DELTA2	THETA2	VO	VOK
.2780-01	.2780+00	.6335-01	.1495+05	.1603+06	.5656-01	.5216-01	.8604+00	.7800+03	.4621+03
FJS	FR	FNS	SFC	FJISEN	CFG	A8EFF	A8HOT	TOD	POD
.3375+03	.9695+02	.2405+03	.1196+01	.3435+03	.9825+00	.1369+03	.1412+03	.3952+03	.5057+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9837+00	.9838+00	.3379+03	.2405+03	.1196+01	.1434+05	.6826+02	.2420-01	.5947+04	.6471+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4512+04	.1290+01	.1051+03	.2201+03	.4628+02	.4487+02	.1339+04	.2130+04	.2656+03	.2760-01

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DATE= 4/24/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

T4-RD0620-09 PERFORMANCE 3-14-68 TIME 147 HRS 33 SEC CONFIGURATION 3,2 DATA PT. 17.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9636+00	.2920+04	.2133+04	.4640+04	.6118+04	.1319+01	.2279+02	.2254+03	.1791+03	.1951+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMM8	FNMM8	SFCMMB
.1811+03	.1621+03	.2548+00	.1640+03	-.1301+02	.1255+01	.1291+02	.3407+03	.2437+03	.1181+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.3411+03	.2437+03	.1181+01	.6532+04	.4673+04	.1273+01	.4701+04	.1301+01	.8835+04	.6857+02
PSLS	PS2A	PS7	CD	P2P	D-DPOO(-)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.7064+00	.6413-00	.1621+01	.9696+00	.7726+00	.1026-01	-.8292-02	.2233-03	-.3167-03	.2798-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.1814-02	-.1912-01	-.1926-01	.5633-02	.1815+04					

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DATE= 4/24/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

14-R00820-09 PERFORMANCE 3-14-68 TIME 149 HRS 15 SEC CONFIGURATION 3.2 DATA PT. 18.0

(ALT)C	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
N+60	.8030+00	.0000+00	.9750+02	.1330+05	.9744+02	.2133+03	.2870+03	.5025+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4284+03	.4461+03	.1151+04	.2570+04	.2503+04	.1873+04	.1827+04	.1811+04	.5485+03
TTS	PUO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.8092+03	.1858+01	.8957+00	.9175+00	.6838+00	.7657+00	.6414+00	.2734+01	.1145+02	.1092+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.1306+02	.1097+02	.2414+01	.2341+01	.6672+00	.7402+00	.7432+00	.6428+00	.6703+00	.5103+00
PSINA/PUO	PSINB/PUO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4837+00	.4938+00	.1501+01	.1495+02	.9536+00	.4742+01	.9578+00	.3153+01	.4731+01	.4588+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2580+01	.4096+01	.1471+01	.2372+01	.3843+01	.3855+01	.2690+00	.1899+00	.3384+01	.2850+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3843+01	.1870+00	.1909-01	.0000+00	.1679+00	.3464+01	.3654+01	.3923+01	.3923+01	.3574+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2336-01	.2231-01	.2075-01	.1777+02	.0000+00	.7217+00	.9561+00	.8399+00	.7808+00	.9969+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7329-01	.6193+02	.3521+02	.1667+02	.6946+02	.3033-01	.4192+00	.2639+00	.5439+00	.1252+00
MS	M3EFF	RNI2	RN4	RN8	RN14GE	DELTA2	THETA2	VO	VOK
.2580-01	.2791+00	.6332-01	.1499+05	.1608+06	.5654-01	.5210-01	.8601+00	.7749+03	.4591+03
FJS	FR	FNS	SFC	FJISEN	CFG	A8EFF	A8HOT	TOD	POD
.3357+03	.9661+02	.2401+03	.1196+01	.3431+03	.9815+00	.1368+03	.1411+03	.3952+03	.5059+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9845+00	.9846+00	.3375+03	.2400+03	.1196+01	.1434+05	.6841+02	.2412-01	.5941+04	.6463+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4606+04	.1289+01	.1051+03	.2197+03	.4634+02	.4493+02	.1338+04	.2125+04	.2658+03	.2861-01

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DATE= 4/24/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 149 HRS 15 SEC CONFIGURATION 3,2 DATA PT. 18.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUPPAP	M8V8	PS8A8	MSVS
.9634+00	.2915+04	.2128+04	.4636+04	.6111+04	.1318+01	.2268+02	.2254+03	.1791+03	.2095+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMMB	SFCMMB
.1802+03	.1615+03	.1093+00	.1045+03	-.1296+02	.1322+01	.1287+02	.3400+03	.2434+03	.1179+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.3409+03	.2433+03	.1180+01	.6526+04	.4672+04	.1272+01	.4700+04	.1300+01	.8824+04	.6862+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.7031+00	.6410+00	.1819+01	.9693+00	.7717+00	.9541-02	-.9052-02	.2578-03	-.2268-03	.6410-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.3451-02	-.2103-01	-.1916-01	.5474-02	.1810+04					

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DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

14-RD0820-09 PERFORMANCE 3-14-68 TIME 152 HRS 41 SEC CONFIGURATION 3.2 DATA PT. 20.0

(ALT)D N+20	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
	.8034+00	.0000+00	.1275+03	.1358+05	.9949+02	.2218+03	.3010+03	.5023+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4279+03	.4461+03	.1170+04	.2645+04	.2575+04	.1933+04	.1884+04	.1859+04	.5489+03
TTS	PUO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.8185+03	.1874+01	.9098+00	.9251+00	.6667+00	.7672+00	.6590+00	.3471+01	.1188+02	.1133+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.1129+02	.1140+02	.2475+01	.2399+01	.6813+00	.7532+00	.7581+00	.6590+00	.6865+00	.5093+00
PSINA/PUO	PSINB/PUO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4854+00	.4936+00	.1507+01	.1549+02	.9535+00	.4802+01	.9594+00	.3225+01	.4859+01	.4712+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS6/P7
.2623+01	.4223+01	.1485+01	.2394+01	.3879+01	.3906+01	.2715+00	.1916+00	.3415+01	.2839+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3879+01	.1879+00	.1994-01	.0000+00	.1679+00	.3499+01	.3691+01	.3962+01	.3962+01	.3607+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2448-01	.2318-01	.2156-01	.1748+02	.0000+00	.7148+00	.9626+00	.8310+00	.7729+00	.9929+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7315-01	.6124+02	.3758+02	.1643+02	.6950+02	.3034-01	.4113+00	.2642+00	.5449+00	.1237+00
MS	M3EFF	RNI2	RN4	RN8	RNI4GE	DELTA2	THETA2	VO	VOK
.2829-01	.2732+00	.6343-01	.1490+05	.1594+06	.5697-01	.5220-01	.8601+00	.7783+03	.4612+03
FJS	FR	FNS	SFC	FJISEN	CFG	A8EFF	A8HOT	TOD	POD
.3469+03	.9789+02	.2490+03	.1209+01	.3545+03	.9785+00	.1370+03	.1412+03	.3951+03	.5067+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9845+00	.9845+00	.3474+03	.2490+03	.1209+01	.1464+05	.6891+02	.2506-01	.6217+04	.6646+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4770+04	.1303+01	.1073+03	.2276+03	.4740+02	.4597+02	.1361+04	.2190+04	.2676+03	.2807-01

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DATE= 4/24/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 152 HRS 41 SEC CONFIGURATION 3,2 DATA PT. 20.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	MBV8	PS8A8	MSVS
.9695+00	.2999+04	.2394+04	.4799+04	.6396+04	.1333+01	.2312+02	.2310+03	.1838+03	.2070+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMMB	SFCMMB
.1841+03	.1654+03	.1178+00	.1043+03	-.1325+02	.1322+01	.1320+02	.3509+03	.2530+03	.1190+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.3514+03	.2529+03	.1190+01	.6722+04	.4846+04	.1283+01	.4876+04	.1312+01	.8848+04	.6940+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.7101+00	.6377+00	.1867+01	.9699+00	.7715+00	.8771-02	-.9410-02	.3933-03	-.2131-03	.3827-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.5270-02	-.1662-01	-.1913-01	.6734-02	.1866+04					

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DATE= 4/24/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

14-RD0820-09 PERFORMANCE 3-14-68 TIME 154 HRS 23 SEC CONFIGURATION 3.2 DATA PT. 21.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
N+20	.8037+00	.0000+00	.1275+03	.1359+05	.9953+02	.2223+03	.3021+03	.5022+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TUR
.0000+00	.4277+03	.4462+03	.1169+04	.2649+04	.2579+04	.1938+04	.1889+04	.1859+04	.5492+03
TTS	P00	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.8509+03	.1874+01	.9087+00	.9250+00	.6865+00	.7679+00	.6387+00	.2614+01	.1186+02	.1131+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	P0
.1127+02	.1138+02	.2472+01	.2397+01	.6736+00	.7125+00	.7163+00	.6386+00	.6704+00	.5063+00
PSINA/P00	PSINB/P00	P2/P0	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/P0	P7/P0
.4849+00	.4936+00	.1517+01	.1545+02	.9535+00	.4798+01	.9593+00	.3220+01	.4883+01	.4735+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2621+01	.4233+01	.1485+01	.2394+01	.3879+01	.3921+01	.2715+00	.1916+00	.3416+01	.2810+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3879+01	.1636+00	.1877-01	.0000+00	.1448+00	.3500+01	.3691+01	.3953+01	.3963+01	.3607+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2457-01	.2327-01	.2164-01	.1706+02	.0000+00	.7148+00	.9624+00	.8289+00	.7718+00	.9892+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7294-01	.6130+02	.3746+02	.1647+02	.6965+02	.3034-01	.4108+00	.2643+00	.5468+00	.1139+00
MS	M3EFF	RNI2	RN4	RN8	RNI4GE	DELTA2	THETA2	V0	V0K
.2545-01	.2736+00	.6349-01	.1489+05	.1592+06	.5678-01	.5225-01	.8602+00	.7842+03	.4646+03
FJS	FR	FNS	SFC	FJISEN	CFG	ABEFF	ABHOT	TOD	POD
.3460+03	.9807+02	.2479+03	.1219+01	.3555+03	.9732+00	.1373+03	.1413+03	.3951+03	.5070+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9817+00	.9817+00	.3459+03	.2479+03	.1219+01	.1465+05	.6885+02	.2515-01	.6235+04	.6622+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4745+04	.1314+01	.1073+03	.2271+03	.4732+02	.4588+02	.1360+04	.2196+04	.2675+03	.2465-01

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DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 154 HRS 23 SEC CONFIGURATION 3,2 DATA PT. 21.0

EFFBURNGE	T4CGE	T5,1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	W8V8	PS8A8	MSVS
.9691+00	.3003+04	.2199+04	.4774+04	.6414+04	.1344+01	.2292+02	.2313+03	.1837+03	.1638+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMMB	SFCMMB
.1818+03	.1624+03	.2380+00	.1038+03	-.1306+02	.1106+01	.1306+02	.3518+03	.2538+03	.1191+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.3517+03	.2538+03	.1191+01	.6734+04	.4857+04	.1284+01	.4886+04	.1313+01	.8846+04	.6960+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.7120+00	.6379+00	.1865+01	.9719+00	.7711+00	.1281-01	-.1095-01	.2848-03	-.4499-03	.5332-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.4115-02	-.1730-01	-.1865-01	.6371-02	.1871+04					

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GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 156 HRS 6 SEC CONFIGURATION 3.2 DATA PT. 22.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
N+20	.8023+00	.0000+00	.1275+03	.1359+05	.9953+02	.2207+03	.3011+03	.5022+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4276+03	.4460+03	.1169+04	.2639+04	.2570+04	.1928+04	.1880+04	.1858+04	.5492+03
TTS	PUO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.8309+03	.1879+01	.9071+00	.9267+00	.6881+00	.7668+00	.6382+00	.2906+01	.1183+02	.1128+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.1123+02	.1134+02	.2472+01	.2397+01	.6714+00	.7409+00	.7450+00	.6535+00	.6746+00	.4998+00
PSINA/PUO	PSINB/PUO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4828+00	.4932+00	.1534+01	.1543+02	.9535+00	.4785+01	.9589+00	.3224+01	.4947+01	.4797+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2620+01	.4215+01	.1489+01	.2401+01	.3890+01	.3911+01	.2723+00	.1921+00	.3425+01	.2801+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3890+01	.1796+00	.1947-01	.0000+00	.1602+00	.3509+01	.3701+01	.3973+01	.3973+01	.3617+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2442-01	.2312-01	.2151-01	.1780+02	.0000+00	.7147+00	.9618+00	.8330+00	.7739+00	.9945+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7316-01	.6160+02	.3714+02	.1654+02	.6968+02	.3033-01	.4060+00	.2641+00	.5469+00	.1203+00
MS	M3EFF	RNI2	RN4	RN8	RNI4GE	DELTA2	THETA2	VO	VOK
.2765-01	.2752+00	.6343-01	.1496+05	.1601+06	.5681-01	.5217-01	.8598+00	.7939+03	.4704+03
FJS	FR	FNS	SFC	FJISEN	CFG	ABEFF	ABHOT	TOD	POD
.3486+03	.9993+02	.2487+03	.1211+01	.3568+03	.9771+00	.1373+03	.1412+03	.3951+03	.5070+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9838+00	.9836+00	.3472+03	.2488+03	.1210+01	.1465+05	.6913+02	.2501-01	.6225+04	.6682+04
FNSC	SFCC	PCNC	P3C	P5.2C	P/C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4767+04	.1306+01	.1073+03	.2267+03	.4739+02	.4595+02	.1359+04	.2186+04	.2680+03	.2693-01

OFFLINE

DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 156 HRS 6 SEC CONFIGURATION 3.2 DATA PT. 22.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9689+00	.2993+04	.2190+04	.4796+04	.6404+04	.1335+01	.2281+02	.2314+03	.1836+03	.1945+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMM8	FNMM8	SFCMM8
.1812+03	.16[illegible]4+03	.1504+00	.1024+03	-.1300+02	.1215+01	.1307+02	.3528+03	.2528+03	.1191+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.3514+03	.2530+03	.1190+01	.6762+04	.4846+04	.1284+01	.4876+04	.1313+01	.8842+04	.6951+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.7084+00	.6378+00	.1865+01	.9723+00	.7708+00	.9207-02	-.7605-02	.2432-03	-.1507-03	.5108-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.3394-02	-.1553-01	-.1869-01	.6659-02	.1862+04					

OFFLINE

DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 157 HRS 48 SEC CONFIGURATION 3.2 DATA PT. 23.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
N+20	.8018+00	.0000+00	.1275+03	.1359+05	.9953+02	.2206+03	.3019+03	.5024+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4277+03	.4459+03	.1166+04	.2642+04	.2573+04	.1934+04	.1885+04	.1855+04	.5491+03
TTS	P00	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.8268+03	.1875+01	.9093+00	.9256+00	.6833+00	.7664+00	.6387+00	.3231+01	.1175+02	.1120+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.1115+02	.1126+02	.2473+01	.2398+01	.6725+00	.7411+00	.7463+00	.6529+00	.6783+00	.5000+00
PSINA/P00	PSINB/P00	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4850+00	.4936+00	.1533+01	.1533+02	.9535+00	.4750+01	.9585+00	.3227+01	.4947+01	.4797+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	FS8/P7
.2615+01	.4226+01	.1486+01	.2396+01	.3881+01	.3900+01	.2717+00	.1917+00	.3418+01	.2804+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3881+01	.1814+00	.1971-01	.0000+00	.1617+00	.3502+01	.3694+01	.3965+01	.3965+01	.3610+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2454-01	.2323-01	.2161-01	.1729+02	.0000+00	.7147+00	.9609+00	.8324+00	.7736+00	.9952+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7282-01	.6175+02	.3672+02	.1663+02	.6960+02	.3033-01	.4220+00	.2641+00	.5461+00	.1214+00
MS	M3EFF	RNI2	RN4	RN8	RNI4GE	DELTA2	THETA2	VO	VOK
.2771-01	.2763+00	.6341-01	.1492+05	.1595+06	.5634-01	.5215-01	.8597+00	.7932+03	.4700+03
FJS	FR	FNS	SFC	FJISEN	CFG	A8EFF	A8HOT	T[illegible]	POD
.3488+03	.9967+02	.2491+03	.1212+01	.3566+03	.9782+00	.1372+03	.1412+03	.3951+[illegible]	[illegible]
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WF[illegible]	F[illegible]C
.9840+00	.9838+00	.3474+03	.2493+03	.1211+01	.1465+05	.6901+02	.2513-01	.6244+0[illegible]	[illegible]+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	[illegible]
.4777+04	.1307+01	.1073+03	.2253+03	.4743+02	.4599+02	.1356+04	.2192+04	.2679+03	[illegible]

OFFLINE

DATE= 4/24/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

T4-R00820-09 PERFORMANCE 3-14-68 TIME 157 HRS 48 SEC CONFIGURATION 3,2 DATA PT. 23.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9677+00	.2997+04	.2196+04	.4806+04	.6424+04	.1337+01	.2286+02	.2512+03	.1837+03	.1963+00
PSSASH	P8ACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMM8	SFCMMB
.1820+03	.1632+03	.1794+00	.1025+03	-.1308+02	.1265+01	.1309+02	.3527+03	.2530+03	.1193+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.3513+03	.2531+03	.1193+01	.6762+04	.4851+04	.1287+01	.4881+04	.1316+01	.8618+04	.6934+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.7033+00	.6380+00	.1869+01	.9712+00	.7724+00	.9863-02	-.8724-02	.4515-03	-.3519-03	.4525-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.2502-02	-.1216-01	-.1875-01	.6975-02	.1867+04					

OFFLINE

DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 201 HRS 13 SEC CONFIGURATION 3.2 DATA PT. 25.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
N-40	.7993+00	.0000+00	.9200+02	.1306+05	.9568+02	.2002+03	.2714+03	.5028+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4278+03	.4456+03	.1137+04	.2504+04	.2439+04	.1818+04	.1774+04	.1767+04	.5484+03
TTS	PUO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.7681+03	.1827+01	.8860+00	.9015+00	.6914+00	.7665+00	.6469+00	.2784+01	.1127+02	.1074+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.1069+02	.1080+02	.2347+01	.2276+01	.6702+00	.7794+00	.7819+00	.6444+00	.6795+00	.5043+00
PSINA/PUO	PSINB/PUO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4850+00	.4935+00	.1520+01	.1470+02	.9535+00	.4800+01	.9584+00	.3062+01	.4654+01	.4513+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2551+01	.3982+01	.1447+01	.2334+01	.3781+01	.3801+01	.2647+00	.1868+00	.3330+01	.2945+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3781+01	.2201+00	.2036-01	.0000+00	.1997+00	.3405+01	.3592+01	.3856+01	.3856+01	.3516+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2264-01	.2144-01	.1994-01	.1691+02	.0000+00	.7289+00	.9523+00	.8404+00	.7847+00	.9946+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7378-01	.6116+02	.3465+02	.1643+02	.6920+02	.3033-01	.3994+00	.2643+00	.5404+00	.1399+00
MS	M3EFF	RNI2	RN4	RN8	RNI4GE	DELTA2	THETA2	VO	VOK
.3294-01	.2772+00	.6348-01	.1496+05	.1609+06	.5728-01	.5216-01	.8590+00	.7855+03	.4654+03
FJS	FR	FNS	SFC	FJIS=N	CFG	ABEFF	ABHOT	TOD	PUD
.3276+03	.9719+02	.2304+03	.1178+01	.3306+03	.9907+00	.1362+03	.1410+03	.3951+03	.5083+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9888+00	.9887+00	.3266+03	.2305+03	.1178+01	.1409+05	.6719+02	.2321-01	.5615+04	.6281+04
FNSC	SFCC	PCNC	P3C	P5.2C	P/C	T3C	T5.1C	W/RT4	WSRI/WPHT
.4417+04	.1271+01	.1032+03	.2160+03	.4500+02	.4364+02	.1323+04	.2065+04	.2645+03	.3424-01

OFFLINE

DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 201 HRS 13 SEC CONFIGURATION 3.2 DATA PT. 25.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9596+00	.2843+04	.2068+04	.4444+04	.5778+04	.1300+01	.2268+02	.2185+03	.1738+03	.2777+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMM8	FNMM8	SFCMM8
.1814+03	.1632+03	.2864+00	.1032+03	-.1313-02	.1607+01	.1282+02	.3288+03	.2316+03	.1172+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.3280+03	.2317+03	.1172+01	.6303+04	.4440+04	.1265+01	.4467+04	.1293+01	.8645+04	.[illegible]755+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.7134+00	.6462+00	.1768+01	.9659+00	.7717+00	.1008-01	-.7850-02	.6976-03	-.3359-03	.5686-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.4507-02	-.1059-01	-.1788-01	.7510-02	.1758+04					

OFFLINE

DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 203 HRS 11 SEC CONFIGURATION 3.2 DATA PT. 26.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
N-40	.7995+00	.0000+00	.9250+02	.1307+05	.9575+02	.2016+03	.2729+03	.5028+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4278+03	.4456+03	.1137+04	.2510+04	.2444+04	.1823+04	.1779+04	.1772+04	.5484+03
TTS	PJO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.7761+03	.1830+01	.8873+00	.9039+00	.6923+00	.7665+00	.6467+00	.2923+01	.1127+02	.1075+02
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.1070+02	.1080+02	.2351+01	.2280+01	.6705+00	.7621+00	.7646+00	.6403+00	.6738+00	.5037+00
PSINA/PJO	PSINB/PJO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4850+00	.4941+00	.1522+01	.1470+02	.9535+00	.4794+01	.9583+00	.3067+01	.4668+01	.4527+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2552+01	.3993+01	.1450+01	.2337+01	.3787+01	.3604+01	.2651+00	.1571+00	.3335+01	.2941+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3787+01	.2083+00	.1995-01	.0000+00	.1683+00	.3410+01	.3598+01	.3863+01	.3863+01	.3522+01
FE3.9	FE4	FE5.1	HPE	OSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2273-01	.2152-01	.2001-01	.1657+02	.0000+00	.7287+00	.9526+00	.8394+00	.7840+00	.9954+00
DH4-5/T4	VR3	C.P	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7364-01	.6124+02	.3464+02	.1646+02	.6929+02	.3033-01	.3955+00	.2642+00	.5414+00	.1354+00
MS	M3EFF	RN12	RN4	RN6	RN14GE	DELTA2	THETA2	VO	VOK
.3148-01	.2775+00	.6348-01	.1496+05	.1608+06	.5717-01	.5216-01	.8591+00	.7867+03	.4661+03
FJS	FR	FNS	SFC	FJISEN	CFG	ABEFF	ABHOT	TOD	POL
.3281+03	.9720+02	.2309+03	.1182+01	.3319+03	.9885+00	.1364+03	.1410+03	.3951+03	.5082+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9874+00	.9872+00	.3273+03	.2310+03	.1181+01	.1410+05	.6729+02	.2330-01	.5644+04	.6290+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4427+04	.1275+01	.1033+03	.2161+03	.4508+02	.4371+02	.1324+04	.2071+04	.2644+03	.3235-01

OFFLINE

DATE= 4/24/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 203 HRS 11 SEC CONFIGURATION 3,2 DATA PT. 26.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9597+00	.2849+04	.2074+04	.4454+04	.5807+04	.1304+01	.2268+02	.2192+03	.1741+03	.2516+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMMB	SFCMMB
.1809+03	.1626+03	.1165+00	.1031+03	-.1309+02	.1507+01	.1278+02	.3301+03	.2328+03	.1172+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.3292+03	.2330+03	.1171+01	.6328+04	.4464+04	.1264+01	.4491+04	.1293+01	.8642+04	.6760+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.7116+00	.6452+00	.1772+01	.9671+00	.7712+00	.9876-02	-.8475-02	.3592-03	-.2870-03	.3410-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.1879-02	-.,994-01	.1134-01	.1232-02	.1763+04					

OFFLINE

DATE= 4/24/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 211 HRS 43 SEC CONFIGURATION 3,2 DATA PT. 31,0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
N+4940	.8505+00	.0000+00	.1025+03	.1345+05	.9857+02	.1720+03	.2573+03	.5028+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4367+03	.4554+03	.1181+04	.2713+04	.2641+04	.2001+04	.1949+04	.1916+04	.5505+03
TTS	PUO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.8021+03	.1517+01	.7344+00	.7481+00	.5774+00	.6382+00	.5385+00	.2854+01	.9529+01	.9173+01
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.9052+01	.9139+01	.2020+01	.1958+01	.5752+00	.6340+00	.6367+00	.5472+00	.5763+00	.3983+00
PSINA/PUO	PSINB/PUO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4841+00	.4931+00	.1602+01	.1493+02	.9627+00	.4718+01	.9590+00	.3165+01	.5071+01	.4917+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2594+01	.4279+01	.1190+01	.1918+01	.3108+01	.3132+01	.2175+00	.1535+00	.2737+01	.2937+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3108+01	.1635+00	.1779-01	.0000+00	.1457+00	.2808+01	.2962+01	.3179+01	.3179+01	.2890+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2512-01	.2473-01	.2300-01	.1675+02	.0000+00	.7132+00	.9447+00	.8204+00	.7668+00	.9923+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7150-01	.6175+02	.3075+02	.1665+02	.6947+02	.3052-01	.3913+00	.2360+00	.5455+00	.1280+00
MS	MSEFF	RNI2	RN4	RN8	RNI4GE	DELTA2	THETA2	VO	VOK
.2695-01	.2743+00	.5137-01	.1178+05	.1255+06	.4442-01	.4342-01	.8779+00	.8395+03	.4968+03
FJS	FR	FNS	SFC	FJISEN	CFG	A8EFF	A8HOT	TOD	POD
.2891+03	.8478+02	.2003+03	.1285+01	.2926+03	.9745+00	.1370+03	.1413+03	.3978+03	.4017+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9664+00	.9862+00	.2344+03	.2004+03	.1284+01	.1436+05	.6706+02	.2620-01	.6325+04	.6566+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4513+04	.1371+01	.1052+03	.2194+03	.4652+02	.4510+02	.1345+04	.2220+04	.2618+03	.2956-01

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DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 211 HRS 43 SEC CONFIGURATION 3.2 DATA PT. 31.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PSRAB	MSVS
.9524+00	.3012+04	.2222+04	.4638+04	.5482+04	.1398+01	.1948+02	.1884+03	.1502+03	.1819+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WS_VSL/G	PSLASL	FJMMB	FNMMB	SFCMMB
.1554+03	.1393+03	.2011+00	.8163+02	-.1126+02	.1215+01	.1100+02	.2908+03	.2060+03	.1249+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.2901+03	.2060+03	.1249+01	.6696+04	.4744+04	.1333+01	.4769+04	.1359+01	.8790+04	.6758+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.6017+00	.5371+00	.1522+01	.9696+00	.6417+00	.9936-02	-.9075-02	.3025-03	-.1998-03	.1840-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.2726-02	-.3309-01	.1226-01	.2405-02	.1928+04					

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DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 213 HRS 26 SEC CONFIGURATION 3.2 DATA PT. 32.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
N+4910	.8508+00	.0000+00	.1025+03	.1345+05	.9857+02	.1730+03	.2573+03	.5026+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4364+03	.4554+03	.1182+04	.2712+04	.2640+04	.2000+04	.1948+04	.1914+04	.5506+03
TTS	PUO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.7983+03	.1519+01	.7363+00	.7492+00	.5770+00	.6390+00	.5387+00	.2615+01	.9557+01	.9200+01
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.9081+01	.9167+01	.2022+01	.1960+01	.5715+00	.6382+00	.6425+00	.5498+00	.5741+00	.4026+00
PSINA/PUO	PSINB/PUO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4848+00	.4933+00	.1587+01	.1496+02	.9626+00	.4727+01	.9592+00	.3164+01	.5022+01	.4868+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2595+01	.4277+01	.1191+01	.1920+01	.3111+01	.3141+01	.2178+00	.1537+00	.2740+01	.2916+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3111+01	.1668+00	.1761-01	.0000+00	.1492+00	.2811+01	.2965+01	.3183+01	.3183+01	.2894+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2609-01	.2470-01	.2297-01	.1649+02	.0000+00	.7133+00	.9452+00	.8202+00	.7667+00	.9906+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7166-01	.6168+02	.3389+02	.1662+02	.6948+02	.3052-01	.3947+00	.2362+00	.5456+00	.1298+00
MS	M3EFF	RN12	RN4	RN8	RN14GE	DELTA2	THETA2	VO	VOK
.2970-01	.2739+00	.5143-01	.1180+05	.1257+06	.4457-01	.4348-01	.8780+00	.8308+03	.4922+03
FJS	FR	FNS	SFC	FJISEN	CFG	ABEFF	ABHOT	TOD	PUD
.2850+03	.8419+02	.2008+03	.1282+01	.2921+03	.9755+00	.1370+03	.1413+03	.3978+03	.4021+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9867+00	.9867+00	.2851+03	.2008+03	.1282+01	.1436+05	.6706+02	.2617-01	.6317+04	.6554+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4418+04	.1368+01	.1052+03	.2198+03	.4650+02	.4508+02	.1346+04	.2218+04	.2619+03	.3017-01

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DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

I4-RD0820-09 PERFORMANCE 3-14-68 TIME 213 HRS 26 SEC CONFIGURATION 3.2 DATA PT. 32.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9528+00	.3011+04	.2221+04	.4642+04	.6473+04	.1394+01	.1937+02	.1886+03	.1504+03	.1907+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMM8	FNMM8	SFCMM8
.1545+03	.1384+03	.9649-01	.8250+02	-.1117+02	.1211+01	.1096+02	.2902+03	.2060+03	.1249+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.2903+03	.2060+03	.1249+01	.6675+04	.4738+04	.1333+01	.4763+04	.1359+01	.8783+04	.6770+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.6010+00	.5375+00	.1524+01	.9698+00	.6424+00	.1110-01	-.1015-01	.4205-03	-.3585-03	.1671-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.1910-02	-.2479-01	.1224-01	.3496-02	.1927+04					

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DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-R0082U-09 PERFORMANCE 3-14-68 TIME 215 HRS 6 SEC CONFIGURATION 3.2 DATA PT. 33.0

(ALT)D	(MO)D	DIO	PLA	N	PCN	FS	WFE	SA	HL
N+4910	.8495+00	.0000+00	.1025+03	.1345+05	.9857+02	.1721+03	.2571+03	.5027+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TOR
.0000+00	.4363+03	.4552+03	.1182+04	.2713+04	.2641+04	.1999+04	.1947+04	.1912+04	.5507+03
TTS	PUO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.8044+03	.1518+01	.7356+00	.7493+00	.5762+00	.6384+00	.5385+00	.3048+01	.9576+01	.9218+01
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.9101+01	.9187+01	.2020+01	.1953+01	.5711+00	.6394+00	.6404+00	.5485+00	.5744+00	.3983+00
PSINA/PUO	PSINB/PUO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4847+00	.4937+00	.1603+01	.1500+02	.9626+00	.4742+01	.9593+00	.3164+01	.5070+01	.4916+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2598+01	.4278+01	.1190+01	.1920+01	.3110+01	.3136+01	.2177+00	.1536+00	.2739+01	.2917+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3110+01	.1658+00	.1767-01	.0000+00	.1482+00	.2810+01	.2964+01	.3181+01	.3181+01	.2892+01
FE3.9	FE4	FE5.1	HPE	OSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2608-01	.2470-01	.2297-01	.1669+02	.0000+00	.7132+00	.9454+00	.8197+00	.7664+00	.9918+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7175-01	.6156+02	.3103+02	.1658+02	.6951+02	.3052-01	.3929+00	.2361+00	.5459+00	.1288+00
MS	M3EFF	RN12	RN4	RN8	RN14GE	DELTA2	THETA2	VO	VOK
.2958-01	.2732+00	.5141-01	.1179+05	.1256+06	.4466-01	.4344-01	.8776+00	.8386+03	.4968+03
FJS	FR	FNS	SFC	FJISEN	CFG	A8EFF	A8HOT	TOD	POD
.2853+03	.8492+02	.2004+03	.1283+01	.2927+03	.9749+00	.1371+03	.1413+03	.3978+03	.4023+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9868+00	.9867+00	.2846+03	.2005+03	.1283+01	.1436+05	.6707+02	.2617-01	.6319+04	.6569+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4614+04	.1370+01	.1052+03	.2205+03	.4649+02	.4508+02	.1347+04	.2219+04	.2618+03	.3009-01

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DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-R00820-09 PERFORMANCE 3-14-68 TIME 215 HRS 8 SEC CONFIGURATION 3.2 DATA PT. 33.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9531+00	.3013+04	.2222+04	.4638+04	.6476+04	.1396+01	.1935+02	.1885+03	.1502+03	.1894+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMMB	SFCMMB
.1545+03	.1385+03	.9633-01	.8163+02	-.1117+02	.1218+01	.1096+02	.2908+03	.2058+03	.1249+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.2900+03	.2059+03	.1249+01	.6693+04	.4738+04	.1333+01	.4763+04	.1360+01	.8752+04	.6763+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.6015+00	.5366+00	.1522+01	.9702+00	.6409+00	.9135-02	-.8470-02	.2111-03	-.4329-03	.2365-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.2026-02	-.2474-01	.1218-01	.2633-02	.1927+04					

OFFLINE

DATE= 4/24/68
GROUP 1
ARO,INC.
ARNOLD AIR FORCE STATION,TENN

14-RD0820-09 PERFORMANCE 3-14-68 TIME 216 HRS 50 SEC CONFIGURATION 3.2 DATA PT. 34.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
N+4920	.8499+00	.0000+00	.1025+03	.1345+05	.9856+02	.1715+03	.2576+03	.5029+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TUR
.0000+00	.4364+03	.4553+03	.1184+04	.2715+04	.2643+04	.2001+04	.1949+04	.1911+04	.5508+03
TTS	POO	PSINA	PSINB	PSI	P2	PS2	P2DIST	PSX	PS3
.7995+03	.1520+01	.7369+00	.7487+00	.5757+00	.6385+00	.5387+00	.2373+01	.9615+01	.9256+01
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.9140+01	.9226+01	.2022+01	.1960+01	.5703+00	.6380+00	.6408+00	.5485+00	.5740+00	.3965+00
PSINA/POO	PSINB/POO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4848+00	.4926+00	.1610+01	.1506+02	.9626+00	.4756+01	.9595+00	.3167+01	.5099+01	.4944+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2601+01	.4280+01	.1192+01	.1922+01	.3114+01	.3134+01	.2180+00	.1539+00	.2743+01	.2910+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3114+01	.1661+00	.1775-01	.0000+00	.1484+00	.2814+01	.2968+01	.3186+01	.3186+01	.2896+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2609-01	.2470-01	.2297-01	.1673+02	.0000+00	.7132+00	.9460+00	.8192+00	.7662+00	.9938+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7183-01	.6148+02	.3124+02	.1654+02	.6956+02	.3052-01	.3980+00	.2361+00	.5464+00	.1293+00
MS	MSEFF	RN12	RN4	RN8	RN14GE	DELTA2	THETA2	VO	VOK
.2956-01	.2726+00	.5141-01	.1180+05	.1257+06	.4480-01	.4344-01	.8777+00	.8424+03	.4991+03
FJS	FR	FNS	SFC	FJISEN	CFG	ABEFF	ABHUT	TOD	POD
.2857+03	.8543+02	.2003+03	.1286+01	.2936+03	.9729+00	.1372+03	.1413+03	.3978+03	.4022+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9868+00	.9866+00	.2046+03	.2003+03	.1286+01	.1436+05	.6716+02	.2617-01	.6329+04	.6576+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4610+04	.1373+01	.1052+03	.2213+03	.4654+02	.4512+02	.1349+04	.2220+04	.2617+03	.2999-01

OFFLINE

DATE= 4/24/68
GROUP 1
ARO, INC,
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 216 HRS 50 SEC CONFIGURATION 3.2 DATA PT. 34.0

EFFBURNGE	T4CGE	T5.1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9537+00	.3015+04	.2223+04	.4634+04	.6486+04	.1400+01	.1932+02	.1888+03	.1504+03	.1889+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMMB	FNMMB	SFCMMB
.1543+03	.1383+03	.1188-01	.8126+02	-.1116+02	.1212+01	.1095+02	.2917+03	.2062+03	.1249+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.2905+03	.2063+03	.1249+01	.6714+04	.4748+04	.1333+01	.4772+04	.1359+01	.8767+04	.6758+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.6009+00	.5366+00	.1524+01	.9709+00	.6421+00	.1108-01	-.1025-01	.2205-03	-.4431-03	.1532-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	T8					
-.1384-02	-.1810-01	.1210-01	.2124-02	.1928+04					

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DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 218 HRS 33 SEC CONFIGURATION 3.2 DATA PT. 35.0

(ALT)D	(MO)D	DTO	PLA	N	PCN	FS	WFE	SA	HL
N+5070	.8577+00	.0000+00	.1110+03	.1375+05	.1008+03	.1830+03	.2729+03	.5025+02	.1861+05
WCW	TT1D	T2	T3	T3.9CALC	T4CALC	T5.0CALC	T5.1CALC	T5.5AVG	TUR
.0000+00	.4378+03	.4564+03	.1200+04	.2796+04	.2721+04	.2071+04	.2015+04	.1977+04	.5509+03
TTS	PUO	PSINA	PSINB	PSI	P2	PS2	P2DIST	P3X	PS3
.8076+03	.1542+01	.7472+00	.7613+00	.5727+00	.6390+00	.5344+00	.3876+01	.9799+01	.9433+01
PS3CALC	P4CALC	P5.2	P7	PLS	PSSPIPE	PSOR1	PSOR2	PTS	PO
.9314+01	.9401+01	.2089+01	.2025+01	.5784+00	.6544+00	.6567+00	.5655+00	.5893+00	.3988+00
PSINA/POO	PSINB/POO	P2/PO	P3/P2	PS3/P3	P3/P5.2	P4/P3GE	P5.2/P2	P5.2/PO	P7/PO
.4847+00	.4938+00	.1602+01	.1534+02	.9627+00	.4690+01	.9594+00	.3269+01	.5238+01	.5076+01
T3/T2	T5.1CALC/T2	WAINA	WAINB	WAIN	WA2GE	WC3	WC4	WA3.1	PS8/P7
.2630+01	.4416+01	.1207+01	.1946+01	.3154+01	.3190+01	.2208+00	.1558+00	.2777+01	.2856+00
WA5.1	WSM	WSL	WPL	WS	WG3.9	WG4	WG5.1	WG8	WA4
.3154+01	.1675+00	.1833-01	.0000+00	.1492+00	.2853+01	.3009+01	.3229+01	.3229+01	.2933+01
FE3.9	FE4	FE5.1	HPE	QSW	EFFCOMP	EFFBURN	EFFTURB	EFFROTOR	WAIN/WA2GE
.2730-01	.2585-01	.2404-01	.1625+02	.0000+00	.7065+00	.9493+00	.8167+00	.7616+00	.9885+00
DH4-5/T4	VR3	CIP	WRT/P4CALC	WRT/P5.2	TPL5.2	M1	M3	M5.2	MSPIPE
.7114-01	.6193+02	.3204+02	.1670+02	.6940+02	.3053-01	.4074+00	.2357+00	.5454+00	.1272+00
MS	M3EFF	RNI2	RN4	RN8	RNI4GE	DELTA2	THETA2	VO	VOK
.2909-01	.2728+00	.5128-01	.1177+05	.1249+06	.4421-01	.4348-01	.8800+00	.8394+03	.4973+03
FJS	FR	FNS	SFC	FJISEN	CFG	ABEFF	ABHOT	TUD	POD
.2979+03	.8617+02	.2117+03	.1289+01	.3050+03	.9767+00	.1370+03	.1414+03	.3979+03	.3592+00
CFGA	CFGD	FJSD	FNSD	SFCD	NC2	WAINC	FE5.1C	WFEC	FJSC
.9868+00	.9868+00	.2978+03	.2117+03	.1289+01	.1466+05	.6805+02	.2732-01	.6692+04	.6852+04
FNSC	SFCC	PCNC	P3C	P5.2C	P7C	T3C	T5.1C	N/RT4	WSRT/WPRT
.4870+04	.1374+01	.1074+03	.2254+03	.4805+02	.4658+02	.1364+04	.2290+04	.2637+03	.2939-01

OFFLINE

DATE= 4/24/68
GROUP 1
ARO, INC.
ARNOLD AIR FORCE STATION, TENN

T4-RD0820-09 PERFORMANCE 3-14-68 TIME 218 HRS 33 SEC CONFIGURATION 3,2 DATA PT. 35.0

EFFBURNGE	T4CGE	T5,1CGE	FNSCGE	WFECGE	SFCCGE	SUMPAP	M8V8	PS8A8	MSVS
.9564+00	.3096+04	.2293+04	.4895+04	.6854+04	.1400+01	.1958+02	.1945+03	.1556+03	.1879+00
PSSASH	PBACH	WBVB/G	PEA9H	SUMPAD	WSLVSL/G	PSLASL	FJMM8	FNMM8	SFCMMB
.1568+03	.1409+03	.3199+00	.8177+02	-.1135+02	.1309+01	.1116+02	.3019+03	.2157+03	.1265+01
FJMMBD	FNMMBD	SFCMMBD	FJMMBC	FNMMBC	SFCMMBC	FNMMBCGE	SFCMMBCGE	WHF	WA2GEC
.3018+03	.2157+03	.1265+01	.6943+04	.4961+04	.1349+01	.4987+04	.1374+01	.8843+04	.6883+02
PSLS	PS2W	PS7	CD	P2P	D-DPOO(+)	D-DPOO(-)	D-DPOO-I(+)	D-DPOO-I(-)	D-DPO(+)
.6007+00	.5329+00	.1575+01	.9687+00	.6420+00	.9454-02	-.8624-02	.2899-03	-.3740-03	.2730-02
D-DPO(-)	DPOO AV	DPOO IAV	DPO AV	I8					
-.3468-02	-.1629-01	.1214-01	.2850-02	.1994+04					

OFFLINE

SUPPLEMENTARY

INFORMATION

AD-393 034

CONFIDENTIAL

ERRATA

AEDC-TR-68-167, October 1968

HIGH ALTITUDE PERFORMANCE TEST OF THE YJ97-GE-3 TURBOJET ENGINE (S/N E447007) (PART I) (U)

W. R. Warwick, B. W. Hartsfield, and B. W. Overall

Arnold Engineering Development Center
Air Force Systems Command
Arnold Air Force Station, Tennessee

Because of additional available information, the pretest estimates of uncertainty have been replaced with posttest estimates.

(1) Section 3.3 should be:

3.3 DATA AND CALCULATIONS

(U) The methods used in calculating the steady-state parameters are presented in Appendix III. The tabulated steady-state test data are presented in Appendix IV. The posttest estimates of uncertainty for the most important performance parameters, based on the estimates of measurement uncertainty in Table I, are presented for the unadjusted test data in Table IIa.

(U) The steady-state test data were adjusted to specification conditions in accordance with the Memorandum of Understanding (Ref. 9). The posttest estimates of uncertainty for the most important performance parameters are presented for the adjusted data in Table IIb. The adjusted data used in this report are presented in Table III.

(2) Table II should be replaced with the following:

TABLE II

(U) POSTTEST ESTIMATES OF UNCERTAINTY FOR PERFORMANCE PARAMETERS

a. Test Conditions

Altitude, ft	36,089	N	N + 5000
Mach Number	0.6	0.8	0.85
Parameter	Percent Uncertainty		
Net Thrust (Scale Force)	±0.79	±1.17	±1.31
Specific Fuel Consumption (Scale Force)	±0.92	±1.30	±1.46
Net Thrust (Momentum Balance)	±1.12	±1.25	±1.25
Specific Fuel Consumption (Momentum Balance)	±1.22	±1.35	±1.35
Primary Engine Airflow	±0.60	±0.61	±0.61
Secondary Airflow	±1.42	±1.71	±1.72
Calculated Turbine Discharge Total Temperature	±1.15	±1.33	±1.34

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b. Adjusted to Rating Conditions

Altitude, ft	36,089	N	N + 5000
Mach Number	0.6	0.8	0.85
Parameter	Percent Uncertainty		
Net Thrust (Scale Force)	±1.46	±1.82	±2.27
Specific Fuel Consumption (Scale Force)	±1.70	±2.01	±2.52
Net Thrust (Momentum Balance)	±1.95	±2.19	±2.19
Specific Fuel Consumption (Momentum Balance)	±2.13	±2.36	±2.36
Primary Engine Airflow	±0.90	±1.01	±1.25
Calculated Turbine Discharge Total Temperature	±1.15	±1.33	±1.34

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1. Based on posttest estimates of two-standard deviations.
2. Uncertainties are percent of performance levels.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 88TH AIR BASE WING
WRIGHT-PATTERSON AIR FORCE BASE OHIO

17 June 2014

88 CS/SCOKIF (FOIA)
3810 Communications Blvd
Wright-Patterson AFB OH 45433-7802

Defense Technical Information Center
Attn: Mr. Michael Hamilton (DTIC-R)
8725 John J. Kingman Rd, Suite 0944
Ft Belvoir VA 22060-6218

Dear Mr. Hamilton,

This concerns the following Technical Reports:

AEDC-TR- 68-167, entitled "High Altitude Performance Test of the YJ97-GE-3 Turbojet Engine (SIN E447007) (Part I) October 1968"

AEDC-TR-68-244, entitled, "High Altitude Performance Test of the YJ97-GE-3 Turbojet Engine *(SIN* E447052) (Part II) December 1968"

Previous classification/distribution code: Secret

Subsequent to WPAFB FOIA Control Number 2014-03680-F-ST3, the above record has been cleared for public release.

The review was performed by the following Air Force organization: Air Force Research Laboratory, Turbine Engine Division, Aerospace Systems Directorate.

Therefore, the above record is now fully releasable to the public. Please let my point of contact know when the record is available to the public. Email: Teresa.Corbin.1@us.af.mil If you have any questions, my point of contact is Ms. Teresa Corbin, phone (937) 257-1436.

Sincerely,

KAREN COOK
Freedom of Information Act Manager
Base Information Management Section
Knowledge Operations

3 Attachments
1. FOIA Request
2. Citation & Cover sheets of Technical Report
3. Copy of AFMC Form 559